

The electricity grid and your health

Answering Your Questions



EirGrid develops, manages, and operates Ireland's electricity grid. We are leading the secure transition of Ireland's electricity grid to a low carbon, renewable future. And we are responsible for the safe, secure, and reliable supply of Ireland's electricity.

The grid brings power from where it is generated to where it is needed throughout Ireland. It supplies power directly to industry and businesses that use large amounts of electricity. The grid also brings power from generators to the domestic network that supplies the electricity you use every day in homes, businesses, schools and hospitals.

This critical infrastructure underpins our societal and economic development. Work carried out now will help create a more sustainable future for the next generation.

Our safety promise

We obey all laws, and meet all applicable health and safety standards. We work for the benefit and safety of every citizen in Ireland.

Electricity is a very safe way to provide energy to homes and businesses, and we use a lot of it in our daily lives. This requires EirGrid to transmit large amounts of electricity.

The main safety risk this creates is accidental electrocution – and this is a very low risk. To protect against this risk, we send this energy on wires carried by poles and pylons, or buried underground in cables.

However, some people worry about the electric and magnetic fields (EMFs) that are found near electricity lines and cables.

What are EMFs?

When electric current flows, both electric and magnetic fields are produced. The EMFs from electricity are in the extremely low frequency end of the electro-magnetic spectrum. They occur in the home, in the workplace, or anywhere we use electricity.

However, people everywhere are exposed to EMFs wherever they live, not just from electricity lines.

Natural sources of EMFs include the earth's geomagnetic field, and electric fields from storm clouds.

EMFs occur anywhere that electricity is generated, transmitted or used. Apart from power lines, this includes electrical appliances and wiring in our homes and businesses.

Like other issues related to manmade technologies, extremely low-frequency EMFs have been measured, researched and closely monitored.

The consensus from health and regulatory authorities is that extremely low frequency EMFs do not present a health risk.

We know that some people have genuine concerns about EMFs and health. This leaflet aims to simply explain the facts about EMFs, based on current information from health and scientific agencies.



Are EMFs the same as radiation?

No. The fields resulting from electricity are fundamentally different from x-ray and gamma ray radiation. Although they are all forms of electromagnetic energy, there are important and fundamental differences.

The term radiation usually refers to electromagnetic energy that falls at the ionising end of the spectrum. This kind of energy is capable of breaking bonds in molecules. This damages our basic biological building blocks – the DNA of our cells.

Only the high-frequency portion of the electromagnetic spectrum is ionising. This includes x-rays and gamma rays.

EMFs from the electricity grid are non-ionising. This term means that they do not have enough energy to cause damage to human or animal cells in the same way ionising radiation does.

Another source of non-ionising energy are EMFs from the earth itself. The non-ionising end of the spectrum also includes radio waves, TV signals, and visible light.

Some people fear that EMFs could cause cancer in the same way that ionising radiation does. However, the scientific consensus is that there is no credible way to explain how this could happen.

Why are there recommendations on exposure to EMFs?

We can't easily avoid EMFs, as western society has become dependent on technologies that produce them.

But too much of anything can affect human health. This applies to every aspect of our lives; from the food we eat, to how sedentary we are. It also applies to EMFs: at high levels of exposure there are harmful effects.

Because of this, health and regulatory authorities recommend exposure limits for extremely low-frequency EMFs.

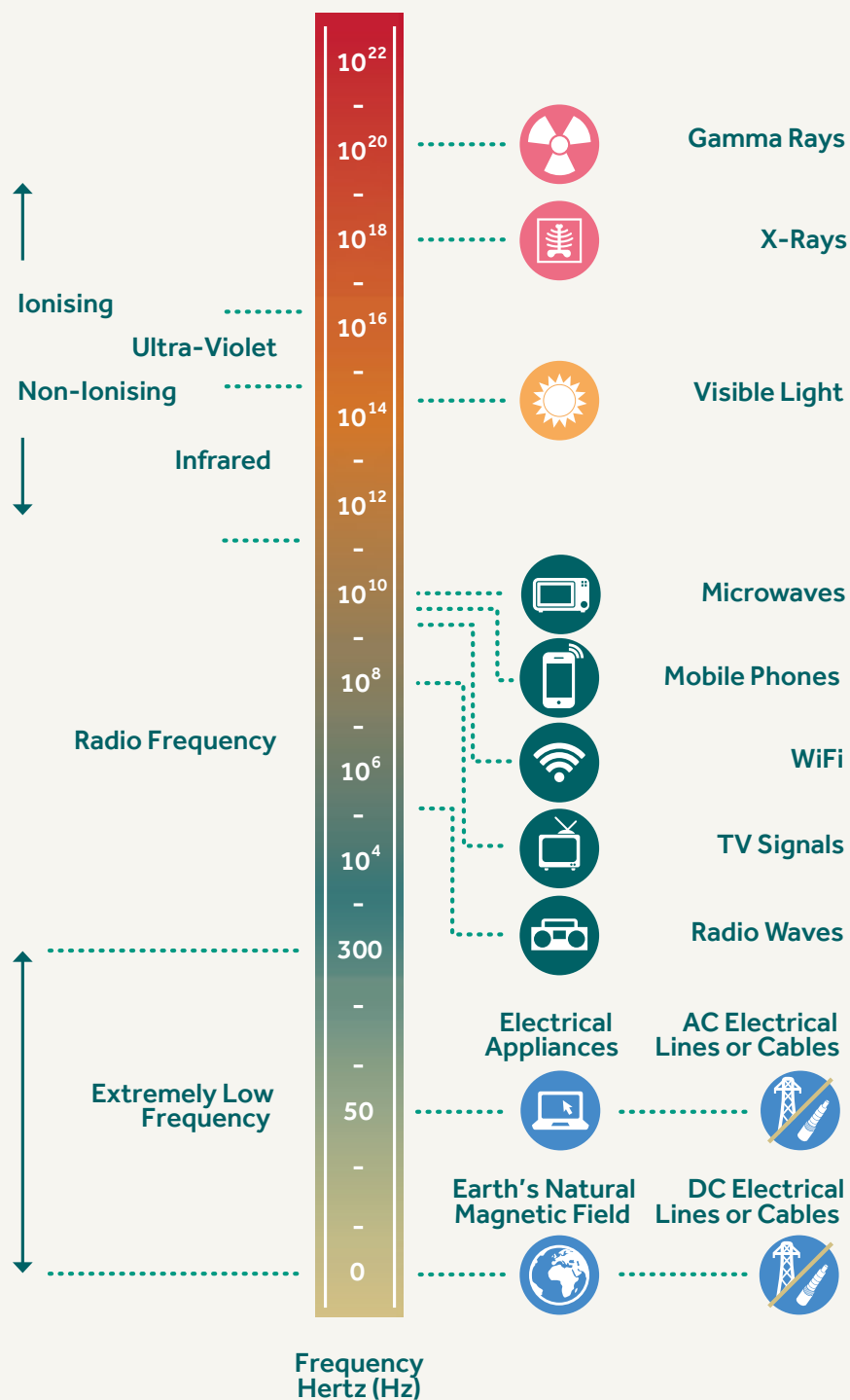
However, forty years of research has found no hazardous effects from long-term exposure to low levels of EMFs.

This includes the small amounts of extremely low frequency EMFs produced by electricity.

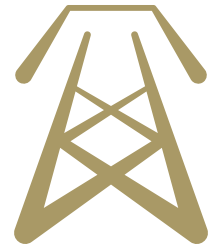
This occurs in home appliances and domestic wiring as well as overhead lines, underground cables, and substations.



Electromagnetic Spectrum



What EMFs do overhead AC power lines produce?



What are the recommendations on exposure to EMFs?

EirGrid operates the transmission grid to stringent safety recommendations. National and international agencies make these recommendations. They do this independently of any grid operator.

Several of these recommendations come from the International Commission for Non-Ionizing Radiation Protection (ICNIRP).

This is an independent body, funded by public health authorities around the world.

ICNIRP has investigated the safety of EMFs for decades, and provides guidance on safe levels of exposure.

The HSE recommends that ICNIRP guidelines are followed to protect the health of the public.

We design the electricity network to make sure that public exposure to EMFs complies with these guidelines.

The diagram on this page shows the levels of EMFs measured near power lines at various distances.

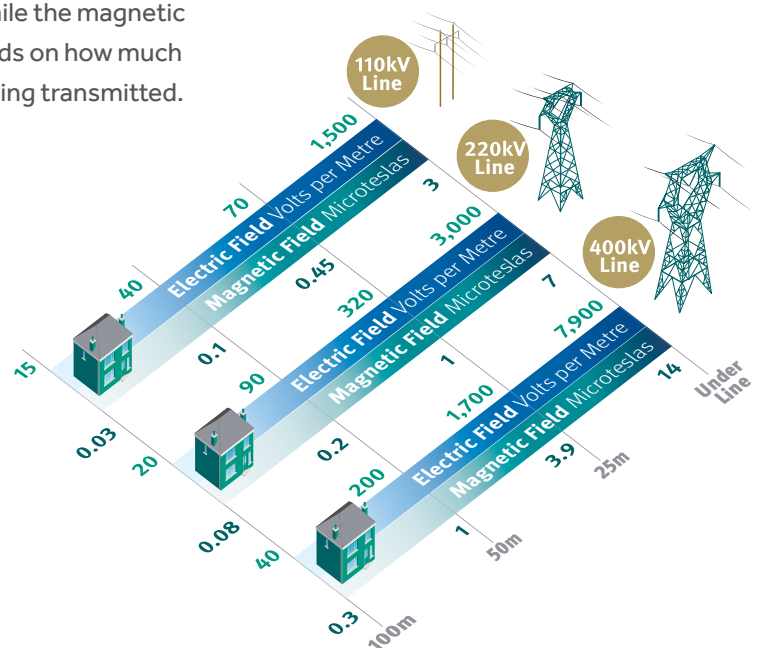
As you can see, levels of EMFs drop considerably as you move away from the lines.

The levels of the electric field depend upon the line voltage, while the magnetic field depends on how much power is being transmitted.

The figures shown are based on the overhead line structures we use operating at typical loads.

The ICNIRP basic restrictions for exposure to 50 Hz fields are:

- Electric field: 9,000 volts per metre.
- Magnetic field: 360 microteslas.
- These basic restrictions can be compared to the values below



Figures shown are typical. Electric fields will vary with the voltage of each installation, and magnetic fields will vary depending on how much power is carried on each type of line.

Alternating current and direct current

Alternating current (AC) is used to generate and transmit electricity across the grid.

It allows us to quickly respond to the changing needs for electricity.

This is important because large amounts of energy cannot be stored. Electricity must be produced as soon as it is needed, and instantly sent to where it is needed.

Alternating current allows for this. This is why the vast majority of the grid is made up of overhead lines carrying high voltage alternating current.

AC electricity is then sent from the grid to the local electricity distribution network. This network uses the familiar wooden poles and lines that supply power to your home. This network carries lower amounts of power, to meet the typical needs of electricity used in homes, farms and small businesses.

Direct current (DC) is an alternative way to transmit electricity. It is generally used to transfer large amounts of power from one point to another.

DC Electricity is generally used for the following purposes;

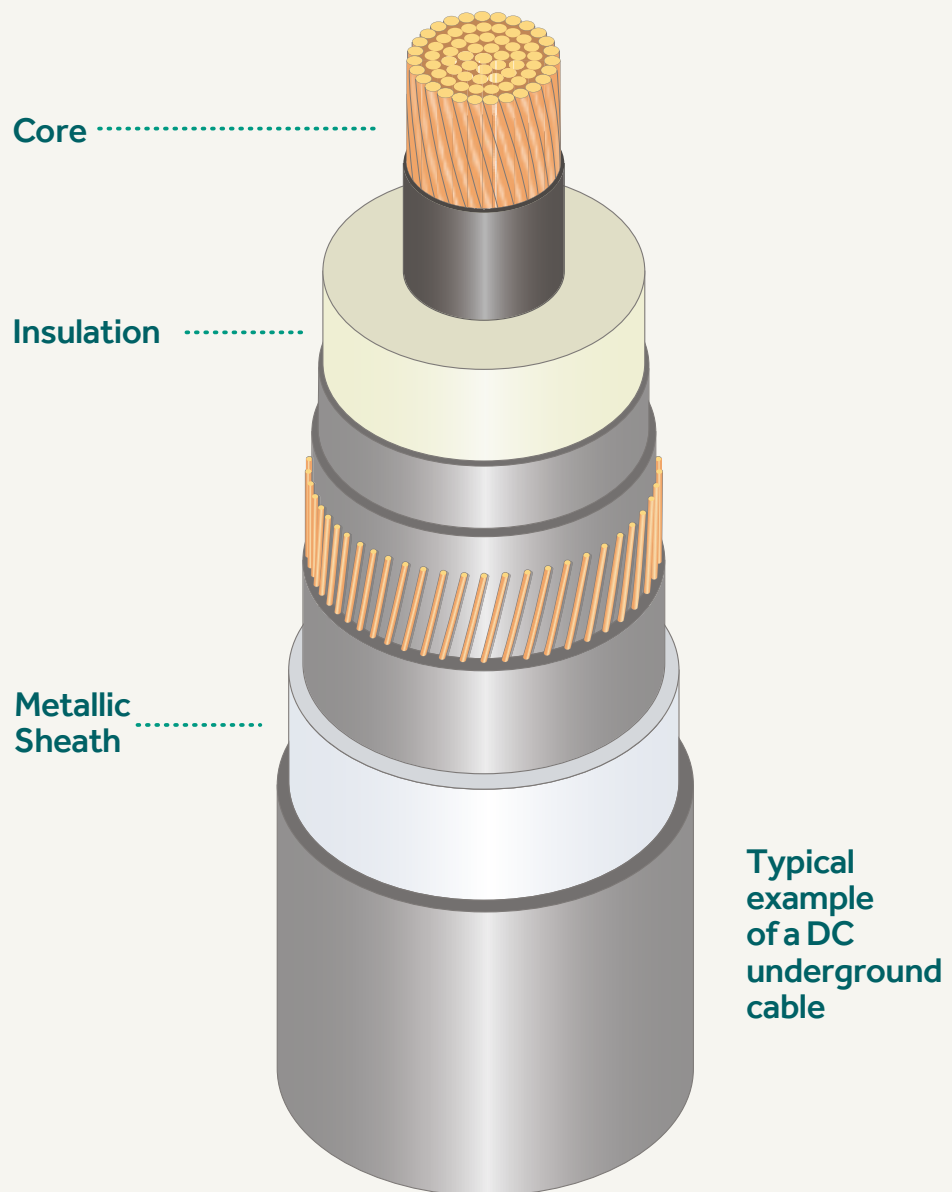
- Transmitting large amounts of power over very long distances – like the East West Interconnector or the proposed Celtic Interconnector.
- Connecting two separate transmission grids of different strength, or that operate at different system frequencies.

In these circumstances, a converter station is needed to change the AC electricity – as used on the grid – to DC electricity. At the destination, another converter station then changes the DC electricity back to AC, so it can be put back on the grid.



How do underground or undersea power cables work?

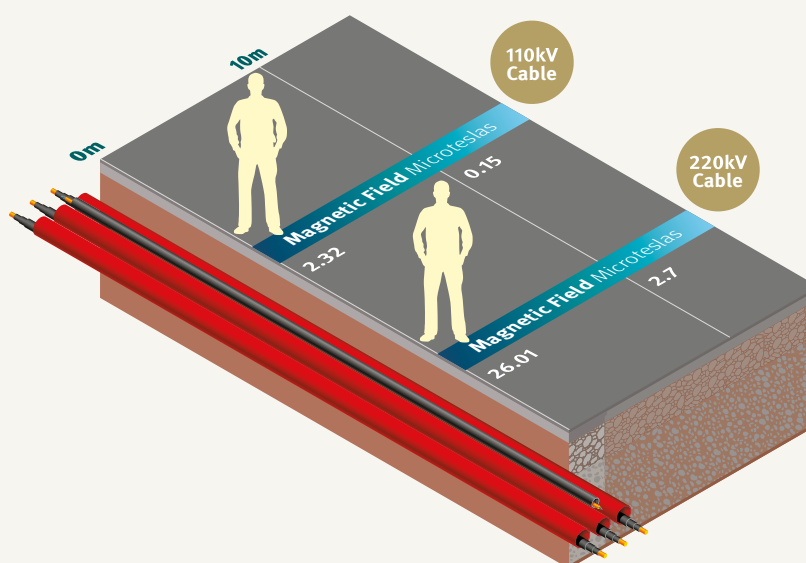
To safeguard the power they carry, high voltage cables are insulated and covered in protective sheaths. The cable's metallic sheath also blocks the electric field.





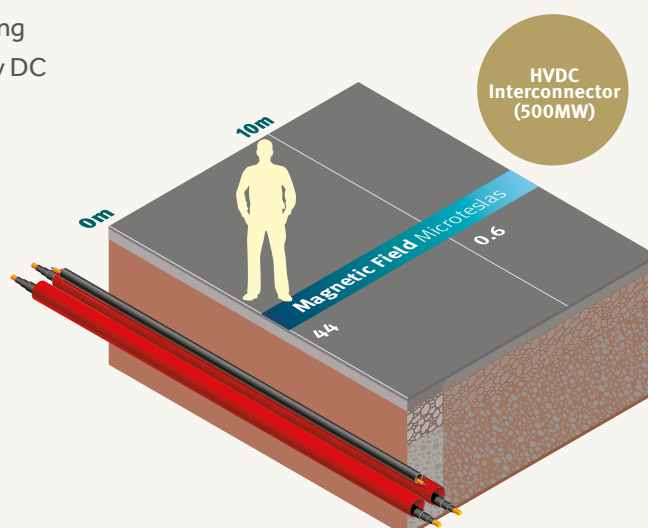
What magnetic field levels do AC underground power cables produce? *

Compare these figures to the ICNIRP basic restrictions for exposure to alternating magnetic fields, like those emitted by AC cables: 360 microteslas.



What magnetic field levels do direct current underground power cables produce? *

Compare these figures to the ICNIRP basic restrictions for exposure to alternating magnetic fields, like those emitted by DC cables: 400,000 microteslas.



* Figures shown are typical. Magnetic field levels will vary for each installation, and will vary depending on how much power is carried in the cable.

Why do some people say EMFs are harmful?

The most common concern about EMFs from power lines is a fear that magnetic fields could be associated with childhood leukaemia.

This was first suggested in a 1979 epidemiological study. These kinds of studies look at patterns of disease in populations. While they cannot prove a cause of disease, they can suggest statistical associations that need further investigation.

Since the 1979 study, the link between power lines and childhood cancer have been comprehensively investigated. These investigations included more epidemiological research, as well as laboratory studies.

Some epidemiological studies have reported associations with magnetic fields; others have not. Studies conducted in the UK, France, Denmark and the US have not established associations between a home near transmission lines and childhood leukaemia.

Crucially, laboratory studies have found no connection and no explanation of how power lines could have this effect.

Based on this history and its own review of research, the World Health Organisation states there is no evidence to conclude that exposure to low-level EMFs is harmful to human health.

This issue has become emotive and controversial for some, as none of us can see EMFs or easily control our exposure to them.

There are campaigners who believe any possibility of risk – even unproven – needs action.

There are also some people with health problems that they believe are caused by power lines.

However, anybody who lives in the modern world has widespread exposure to extremely low-frequency EMFs. This is the case whether or not they live near power lines.

Will EMFs be declared hazardous in future?

Those who have fears about EMFs worry that, in future, science will eventually discover they are hazardous.

They look at known carcinogens like tobacco and point out that it was once viewed as safe.

It is helpful to explore this comparison to provide further reassurance.

When there are concerns about a potential health hazard, scientists look for evidence across a variety of studies.

The link between cigarettes and lung cancer was first proposed in 1930s. This was when population studies first showed the clear parallel rise in cigarette consumption and lung cancer.

It took just 20 years to prove this cause and effect, using animal testing, cellular pathology and chemical analysis.



By the 1950s, the scientific case was proven. Over the following decade, health and government authorities started to act on this proof.

In comparison, electricity has been transmitted over lines since the start of the 1900s.

There have been more than 100 years of power line use. There has also been over forty years of scientific research into overexposure to low frequency EMFs from all electrical sources, including power lines.

The WHO states: "Despite the feeling of some people that more research needs to be done, scientific knowledge in this area

is now more extensive than for most chemicals."

There has been a very significant amount of historic exposure, and very lengthy period of on-going and rigorous investigation.

Yet, there is no conclusive proof that EMFs from power lines are hazardous, nor to explain how they could cause harm.



Want to know more?

This leaflet is EirGrid's summary on this topic. If you want to investigate further, here are some useful links to information on EMFs from national and international agencies.

International Commission

on Non-Ionizing Radiation Protection:

www.icnirp.org/

World Health Organization

www.who.int/news-room/questions-and-answers/item/radiation-electromagnetic-fields

European Commission

www.health.ec.europa.eu/index_en

Irish Government

www.hsa.ie/eng/topics/physical_agents/electromagnetic_fields/electromagnetic_fields

US National Institute of Environmental Health Services

www.niehs.nih.gov/health/topics/agents/emf/index.cfm

Environmental Protection Agency

www.epa.ie/environment-and-you/radiation/emf/emf-and-your-health/emf-guidelines/



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