

Electric and Magnetic Fields



Scientists and researchers have studied the issue of health effects regarding electromagnetic fields (EMF), and the delivery and use of electricity since the early 1970s.

Idaho Power has monitored this research over the years. The following are questions and answers regarding EMFs based on that research.

The information here provides a general background for understanding and discussing the topic.

Electric and Magnetic Fields



What are electromagnetic fields, or EMFs?

Electric and magnetic fields (EMFs) exist everywhere in our modern society; everyone is exposed to them in varying degrees. Electric currents flowing deep within the earth's core produce the earth's strong magnetic field. And all power lines and electrical devices in our modern society—appliances, computers and household wiring—produce EMFs.

EMFs are invisible forces created by any electric charge. As you move farther away from the source, those forces decrease rapidly in magnitude. Electric fields are the result of the strength (voltage) of the electric charge. On the other hand, magnetic fields are the result of the motion (current) of the charge. Taken together, these fields are often referred to as electromagnetic fields.

The fields associated with electricity are considered to be "extremely low frequency" fields because at 60 Hertz (Hz) they are located at the extreme low end of the electromagnetic spectrum.

What are the known health effects of EMFs?

According to researchers, there are no confirmed health risks associated with EMFs. This research stems from the early 1970s, when questions began to surface about the possible adverse health effects associated with electric fields produced near power lines. In response to these questions, numerous studies on the issue have been conducted. When research found no significant effects, the focus shifted toward the possible adverse health effects of magnetic fields.

The major research on EMF and potential health effects has been performed in the following four areas:

Epidemiology

Epidemiology is the science that attempts to establish patterns, links or associations between disease-causing agents and diseases in human populations, such as cancer or leukemia. However, the epidemiological evidence for a relationship between exposure to low frequency (60 Hz) EMFs is inconsistent, ranging from weak to non-existent.

Biological Studies

Biological studies are used to detect EMF responses on individual cells or DNA and determine if magnetic fields cause damage to cells. There is no consistent evidence that EMF exposure damages either cells or DNA. Generally, cancer initiation is caused because DNA has been damaged, but the results of EMF exposure to cells and DNA have been negative.

Animal Studies

Animal studies are used to determine if there are any biological effects of EMF on animals to determine if exposure causes cancer in rodents, for example. Numerous studies have been performed on animals at a variety of exposure levels over several generations. The data does not support a conclusion that exposure to 60-Hz EMF has an effect on the frequency or pattern of cancer.

Clinical Studies

Clinical studies test the exposure of human volunteers to EMF levels higher than generally encountered in residential or work environments. Human responses have been detected at extremely high field strengths, but generally do not correlate or show association with health hazards.



- The American Cancer Society reviewed a January 2000 study that found no association between EMFs and childhood cancer: "This was a nice, large, population-based study. It found no evidence of an association of EMF and acute lymphoclastic leukemia, all leukemias, central nervous system tumors, and all other malignant disease."
- A 1996 report by the National Research Council concluded that "after examining more than 500 studies spanning 17 years of research, the committee said there is no conclusive evidence that EMFs play a role in the development of cancer, reproductive and developmental abnormalities, or learning and behavioral problems."
- The most recent comprehensive study, completed by the Institute of Cancer Epidemiology—Danish Cancer Center, in Denmark, and published in the December 2006 Journal of the National Cancer Institute, evaluated cell phone records of more than 420,000 people between 1982 and 1995 to determine if there was any increase in cancerous tumors in the brain, salivary glands, eyes or ears, or a heightened risk of leukemia caused by EMF in cell phones, and concluded there was no evidence of any link to cancer.
- On its website in 2006, the World Health Organization (WHO) posted the following statement about EMF research and reports: "A mix of studies in different research areas is essential for the evaluation of a potential adverse health effect of electromagnetic fields. Different types of studies investigate distinct aspects of the problem." WHO suggests that individuals judge reports by the media and other groups with caution.

How are EMFs measured?

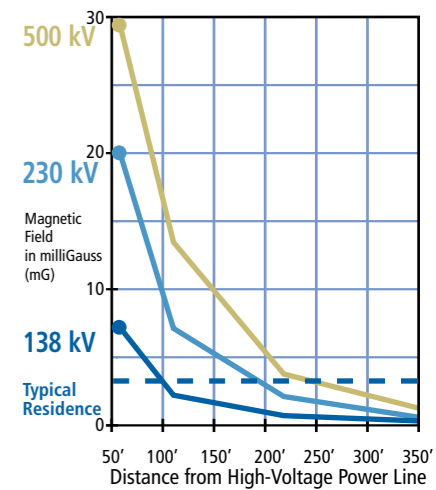
EMFs can be measured with instruments or calculated with computer programs. Electric fields are typically measured in volts per meter (V/m) or kilovolts per meter (kV/m). Magnetic fields are typically measured in milliGauss (mG).

An EMF measurement can provide information about the magnetic field strength in a particular area, not whether exposure puts you at risk. Science has not determined that any health risk exists.

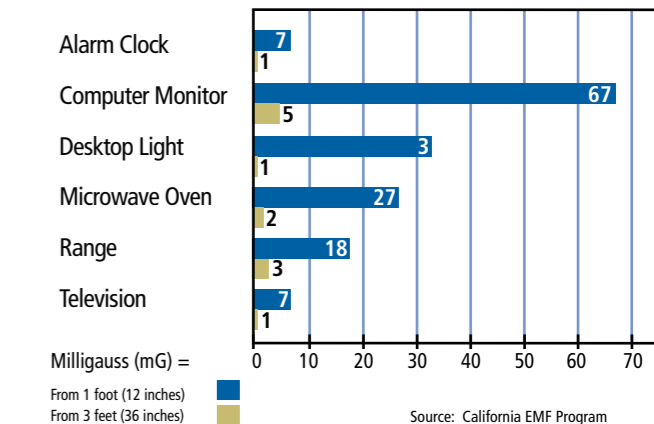
Magnetic Fields & Distance

Depending on the type of line and its current, magnetic fields from power lines at a distance of 100 feet become less than those produced by the typical residence.

Magnetic fields and distance from high-voltage power lines in comparison to typical fields in residences that are not near high-voltage lines. Data is from the US National Research Council.



Examples of typical magnetic field strengths at specific distances (12" and 36") from appliance surfaces:



Are there any established EMF exposure limits in Idaho?

No. Some states have them, but none have been established for Idaho. A great deal of animal testing and cell biology research has been conducted worldwide, but even extremely high EMF exposure has never produced cancer or any other disease in the laboratory. Scientists, therefore, cannot identify any level of EMF that is harmful in any way. Since no level of exposure has been shown to be hazardous, no federal government environmental EMF standards have been adopted.

While there are no federal or Idaho-established limits for EMF exposure, some governmental and non-governmental organizations have issued advisory limits. These limits, however, do not apply to the low levels of EMF found in homes, schools, and offices, or even the EMF exposures being studied in relation to childhood leukemia.

The advisory limits apply only to extreme, short-term EMF exposures far higher than those in residential or typical occupational settings. For example, the International Commission on Non-Ionizing Radiation Protection recommends that the general public not be exposed to magnetic field levels above a 24-hour average of 10,000 milliGauss (mG). In contrast, fields inside homes rarely exceed an average of 20 or 30 mG.



Frequently Asked Questions

Q Do EMF levels increase when the voltage of a line increases, like rebuilding a 69-kV line to 138 kV?
A The magnetic field of a power line depends on both the current in the line and the distance from it. When the voltage of a line is increased, it requires greater clearance and thus greater distance from the ground. And when voltage is doubled, as in this example, the current drops by half. Combined with the increased distance, the magnetic field is actually reduced by two-thirds.

Q Do underground power lines limit EMFs?
A Not necessarily. The maximum magnetic field will generally be higher for underground lines, but much depends on the method of construction.

Q Should I have an EMF strength reading done in my home?
A Idaho Power will measure EMF strength upon request and will discuss the results with the customer.

Q Should I limit my exposure to electrical appliances?
A The research does not suggest that people need to change the way they use electrical appliances, or limit the amount of time they use certain appliances.

For more information

Contact us for information on research and regulatory developments pertaining to this issue.

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Additional Resources on EMFs

Medical College of Wisconsin

www.mcw.edu

Search: Electromagnetic Fields and Human Health

National Institute of Environmental Health Sciences

U.S. Department of Health and Human Services

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

World Health Organization

Electromagnetic Fields

www.who.int/peh-emf/en

International Commission on Non-Ionizing Radiation Protection

www.icnirp.de/PubMost.htm

See Low-frequency reports

www.icnirp.de/documents/LFGdl.pdf

Government of Canada

Health Canada

www.healthycanadians.gc.ca/environment-environnement/home-maison/emf-cem-eng.php

www.hc-sc.gc.ca/ewh-semt/radiation/fpt-radprotect/emf-cem-eng.php

National Cancer Institute

National Institutes of Health

www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields