

Overview of Electric and Magnetic Fields

What is EMF?

Electric fields occur anywhere there is electric power. For example, an electric field is present when an appliance is plugged into an outlet, even if it is not turned on. Electric fields can be blocked or shielded by objects such as buildings or trees. They are typically measured in volts per meter.

Magnetic fields are produced when electric current is flowing, so they are only present when an appliance is turned on. As the flow of electricity – the current – increases, the magnetic field increases. Magnetic fields pass through most objects and cannot be blocked as easily as electric fields.

Together, electro-magnetic fields are known as EMF and are found everywhere there is electricity, including household wiring, electric appliances and power lines. Both electric and magnetic fields are strongest at the electrical source and diminish quickly with distance. A large majority of the scientific studies and reviews performed over the last 25 years have focused primarily on magnetic field exposure, so the term “EMF” usually refers to magnetic fields.

What do scientific studies say about EMF?

One of the largest evaluations of EMF to date was led by two U.S. government institutions, the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health and the U.S. Department of Energy. The agencies received input from a wide range of public and private agencies. This six-year project was designed to provide scientific evidence to determine whether exposure to power-frequency EMF involves a potential risk to human health. The agencies also developed materials to inform the public about EMF.

In 1999, NIEHS reported to the U.S. Congress that the overall scientific evidence for human health risk from EMF exposure was determined to be weak and that aggressive regulatory action was not warranted.

* Sources

Electric and Magnetic Fields & Transmission Lines (October 2009). Retrieved from <https://www.bpa.gov/Projects/Projects/1-5/Documents/Electric-magnetic-fields-transmission-lines-2009.pdf>

Understanding electric and magnetic fields. Retrieved from <https://www.pacificpower.net/outages-safety/electrical-safety/understanding-electric-and-magnetic-fields.html>

Do EMF Levels Decrease with Distance?

EMF decreases with distance from the source. The electric field near outdoor transmission lines are typically stronger than those found in homes because they have a higher voltage than residential resources, appliances or devices. However, the magnetic fields around electrical appliances in the home can be as high or higher than those around outdoor power lines. EMF contact from power lines is reduced significantly by the distance from the wires due to the pole or the tower's height. In addition, it is shielded by trees and homes and reduced further by the walls of a structure.

Source of Magnetic Field*	1.2 Feet Away	12 Feet Away	36 Feet Away
 Microwave Oven	750 to 2,000	40 to 80	3 to 8
 Clothes Washer	8 to 400	2 to 30	0.1 to 2
 Hair Dryer	60 to 20,000	1 to 70	0.1 to 3
 LCD/Plasma TV	1.1 to 73.6	0 to 2.5	0 to 2.2

Transmission	Under Line	Edge of Line	50' from Edge
44kV	1.0 - 25.0	0.2 - 2.5	0.1 - 1.0
100kV	2.1 - 19.3	0.6 - 3.4	0.3 - 1.9
230kV	4.5 - 29.0	1.9 - 6.4	1.0 - 3.5

How does EMF affect the siting of transmission lines?

Central Electric Power Cooperative, Inc. (Central) relies on NIEHS and the U.S. Department of Energy findings and conclusions for guidance and direction when addressing EMF exposure for new transmission facilities.

