



which explains the basic principles of electric and magnetic fields, provides an overview of the results of major research studies, and summarizes conclusions of the expert review panels to help you reach your own conclusions about EMF-related health concerns. You can view that booklet at <http://www.niehs.nih.gov/emfrapid/booklet/home.htm>.

The World Health Organization (WHO) provides information about EMF at <http://www.who.int/peh-emf/about/WhatisEMF/en/>. This Web site also includes links to EMF research, an EMF international project and EMF standards, as well as links to fact sheets, publications and information sources.

The State of Connecticut Siting Council commissioned the Gradient Corporation to prepare a report titled, "Current Status of Scientific Research, Consensus, and Regulation Regarding Potential Health Effects of Power-Line Electric and Magnetic Fields (EMF)."

The purpose of this report was to compile information identified from EMF research articles, the conclusions from EMF scientific reviews, and the analyses by public health consensus groups that address possible health effects of 60 hertz (Hz) EMF exposure from power frequency sources. The entire report can be found at [http://www.ct.gov/csc/lib/csc/emf\\_bmp/emf\\_report.pdf](http://www.ct.gov/csc/lib/csc/emf_bmp/emf_report.pdf).

The links listed here are provided for your reference only. Neither Ameren nor its subsidiaries have any control over these Web sites, nor are they responsible for the contents of these Web sites. Ameren and its subsidiaries make no representation or warranty regarding these Web sites or the contents or materials on such Web sites.

### Typical Magnetic Field Levels from household sources\*

(in milligauss, mG)

Distance from Source	6 in.	1 ft.	2 ft.	4 ft.
<b>Blenders</b>				
** Lowest	30	5	—	—
Median	70	10	2	—
Highest	100	20	3	—
<b>Can Openers</b>				
Lowest	500	40	3	—
Median	600	150	20	2
Highest	1,500	300	30	4
<b>Dishwashers</b>				
Lowest	10	6	2	—
Median	20	10	4	—
Highest	100	30	7	1
<b>Microwave Ovens</b>				
Lowest	100	1	1	—
Median	200	40	10	2
Highest	300	200	30	20

The dash (—) in the above table means that the magnetic field measurement at this distance from the operating appliance could not be distinguished from the background measurements taken before the appliance had been turned on.

### Typical Magnetic Fields produced by Ameren Transmission Lines<sup>1</sup>

(in milligauss, mG)

Type of Transmission Line	Maximum on Right of-Way
<b>138/161 Kilovolts (kV)</b>	
Single power line <sup>2</sup> on two wooden poles	45-160
Single power line <sup>2</sup> on one steel pole	25-105
Two power lines <sup>2</sup> on steel towers or steel poles	10-85
<b>345 Kilovolts (kV)</b>	
Single power line <sup>3</sup> on two wooden poles	72-240
Single power line <sup>3</sup> on one steel pole	60-160
Two power lines <sup>3</sup> on steel towers or steel poles	55-155
<b>Combination 345kV and 138kV<sup>4</sup></b>	35-180

<sup>1</sup> The values shown in this table are typical for normal system peak operating conditions and do not reflect abnormal circumstances that rarely occur for a short period of time.

<sup>2</sup> A single 138/161 kV transmission line consists of three large wires and one or two small wires to protect the line from lightning damage.



### USEFUL ADDRESSES/PHONE NUMBERS

Ameren's EMF Information Line:

**314-554-2402**

U.S. Food & Drug Administration

The Center for Devices & Radiological Health

FDA/CDRH/OCER/DSMICA (HFZ-220)

1350 Piccard Drive

Rockville, MD 20850-430

**314-645-1167**

U.S. Environmental Protection Agency

Office of Radiation and Indoor Air

Radiation Protection Division (MC 6608J)

1200 Pennsylvania Avenue, NW

Washington, D.C. 20460-0001

**202-343-9677**

National Institute of Environmental Health Sciences

Office of Communications & Public Liaison

P.O. Box 12233, MD NH-10

Research Triangle Park, NC 27709-2233

**919-541-3345**

Distance from Source	6 in.	1 ft.	2 ft.	4 ft.
<b>Hair Dryers</b>				
** Lowest	1	—	—	—
Median	300	1	—	—
Highest	700	70	10	1
<b>Video Display Terminals (PCs with color monitors)</b>				
Lowest	7	2	1	—
Median	14	5	2	—
Highest	20	6	3	—
<b>Refrigerators</b>				
Lowest	—	—	—	—
Median	2	2	1	—
Highest	40	20	10	10
<b>Fluorescent Lights</b>				
Lowest	20	—	—	—
Median	40	6	2	—
Highest	100	30	8	4

\* From *EMF in Electric and Magnetic Fields Associated with the Use of Electric Power*, National Institute of Environmental Health Sciences (June 2002).

\*\* Refers to the lowest, median and highest readings of all appliances measured in each category.

Distance from the Center of the Right-of-Way	Maximum on Right of-Way					
	50 ft.	75 ft.	100 ft.	200 ft.	300 ft.	400 ft.
15-55	5-30	5-15	1-5	0-2	0-1	
10-35	5-20	3-11	1-3	0-2	0-1	
5-55	3-35	2-23	0-7	0-3	0-2	
40-130	25-75	15-50	4-13	2-6	1-4	
30-90	20-55	12-35	3-10	2-5	1-3	
45-120	30-80	20-55	5-16	2-7	1-4	
10-145	10-90	8-55	3-13	1-6	1-3	

<sup>3</sup> A single 345 kV transmission line consists of three sets of two large wires and one or two small wires to protect the line from lightning damage.

<sup>4</sup> Values in this table should not be added or subtracted to calculate different combinations of line configurations because the field from each wire affects the fields from other wires and are not necessarily cumulative.

# Answering Your Questions About Electromagnetic Fields



*For three decades, researchers have studied electric and magnetic fields (Electromagnetic Fields - EMF) — those fields generated by everything electrical from power lines and house wiring to personal computers and household appliances.*

Because we, at Ameren, care about the safety of the public and the safety of our facilities, we have supported research to determine the impact of EMF on human health. We have offered this support even though extensive research has never found a cause-and-effect relationship between exposure to these fields and any illness or disease.

*Our current practice is to . . .*

- Design new facilities in a manner that minimizes EMF exposure.
- Provide a free service to Ameren companies' customers who wish to have magnetic fields measured inside or outside their homes or businesses. (NOTE: To conduct a field survey, we must have the owner's consent to access private property.)

We appreciate your interest in this topic and hope you find this brochure useful. If you need more information on EMF or Ameren companies' services, please call our EMF information line at (314) 554-2402.

### **What is EMF?**

Electromagnetic fields are generated by anything that uses or conducts electricity — not just power lines.

*EMF consists of two components:*

- Electric fields are created by the voltage of electricity in a wire (similar to water "pressure" in a hose) — the higher that voltage, the stronger the electric field. Electric fields are produced on any energized conductor regardless of whether current is flowing.
- Magnetic fields exist only when current is flowing (similar to water moving through a hose) — the greater the current, the stronger the magnetic field.

EMF field measurements taken in homes and businesses show that most people receive far more exposure (on a short-term basis) from their own refrigerators, television sets, computers and other electrical devices than from power lines.

Since 1979, EMF research has focused on magnetic fields because no direct health-related effects have been attributed to the electric field component. Thus, in reporting EMF results, it is common practice only to identify the magnetic field portion, even though an electric field is present at the same time.

### **How are magnetic fields measured?**

The intensity of magnetic fields is measured with an instrument called a gauss meter. Field intensity is typically recorded in milligauss (one-thousandth of a gauss). Electromagnetic fields decline substantially with distance from the source. Lines that are many feet away from a person offer less exposure than appliances that are much closer. Measurements are merely a snapshot of values at a given time and are valid only for that moment. Values can

change dramatically depending upon the amount of electricity flowing through power lines or appliances at any given time.

### **Are magnetic fields harmful?**

The "weight of evidence" in the scientific community is that no one knows, with certainty, if any aspect of EMF exposure affects human health.

- The most comprehensive study to date done by the National Institutes of Health and completed in 1997 indicated "a small increased risk for childhood cancer based on epidemiological research, but emphasized the absence of supporting laboratory evidence to substantiate this link."
- The American Physical Society has stated that "the preponderance of the epidemiological and biophysical/biological research findings have failed to substantiate those studies that reported specific adverse health effects from exposure" to magnetic fields.
- In fact, there is not a U.S. Environmental Protection Agency, state or local standard that imposes a specific limit on EMF exposure related to any power frequency level applicable to the Ameren companies' service territories. The EPA has concluded that "there is no established cause-and-effect relationship between EMF exposure and cancer or other disease."

Scientists have found that fields can produce a variety of biological effects. They can change the levels of specific chemicals the body makes and the functioning of individual nerve cells. However, biological effects are not the same as adverse health effects, and in the context of the possible risks we face, scientists tell us EMF exposure, if it poses any risk at all, is well down the list.

### **Some epidemiological studies cite an association between magnetic fields and some types of cancer.**

#### **What is an association?**

An "association" in epidemiology (statistical analysis of disease occurrence in a population) does not mean that some factor "causes" or even "contributes to" a specific result, but, rather the result tends to occur in the presence of, or in conjunction with, some factor. For example, an "association" exists between the number of television antennae in a region and death rates from heart attacks. This does not mean that televisions "cause" heart attacks, but it may mean that people watching television are more sedentary, increasing their coronary risk.

Establishing an actual cause-and-effect relationship is a difficult scientific challenge requiring consistent findings in various research areas. A cause-and-effect relationship has never been established between power frequency electromagnetic fields and any form of cancer.

#### **What are typical magnetic field ranges?**

Typical ranges are 0.5 to 4 milligauss for a home's background level. Actual levels measured by Ameren companies' engineers in urban homes range from 0 to 50 milligauss (see table in this publication of typical field levels compiled by National Institute of Environmental Health Sciences).

#### **How far do I have to be from utility company facilities to be safe?**

No one can tell you whether any distance is safe or unsafe. However, the magnetic fields typically drop to background levels within a few hundred feet. The magnetic fields next to power lines or substation equipment depend upon the amount of electricity carried and the design (see the table

of typical values in this publication). For information about a specific location, call our EMF information line at (314) 554-2402.

#### **Why doesn't the utility company bury lines if fields drop off rapidly?**

Burying lines does not eliminate exposure. While electric fields are easily shielded, magnetic fields are not. At street level, magnetic field strength from underground power lines depends on the number of cables, the spacing of the cables, the amount of current flowing through the lines and the distance you are from them.

#### **How does the proximity to power lines and EMF affect property values?**

A 1995 study by the Bonneville Power Administration showed that homes near transmission lines were worth about one percent more or less than comparable homes located away from lines.

### **INTERNET SITES WITH INFORMATION ON ELECTRIC AND MAGNETIC FIELDS**

Ameren companies attempt to provide the most current, non-utility industry information on electric and magnetic fields available. Numerous independent national and international organizations, such as those listed here, have convened groups of scientists to review EMF research and provide accurate, up-to-date information on various Web sites.

*Here are three such Web sites:*

The National Institute of Environmental Health Sciences (NIEHS) has published a booklet called "EMF: Electric and Magnetic Fields Associated With the Use of Electric Power,"