Electric and Magnetic Fields

Definitions

- Electromagnetic Field (EMF): A field of force that consists of both electric and magnetic components, resulting from the movement of an electric charge containing a definite amount of electromagnetic energy.
- Kilovolt (kV): A volt is the unit of electromotive force, the difference of potential that would drive one ampere of current against one ohm of resistance. A kilovolt is 1,000 volts.
- Gauss: A unit of magnetic induction.
- Low Frequency (LF): The International Telecommunication Union for radio frequencies in the range of 30-3000kHz. Transmission lines operate in the 60Hz range.

AES Ohio is committed to safely providing electric service for our customers and ensuring a safe working environment for our employees.

Electric fields are produced by voltage. Electric fields can be found around any electrical appliance that is plugged in (i.e. a bedside lamp). Magnetic fields are produced by current or electricity flowing through a wire. This would require the bedside lamp to be plugged in and turned on to generate a magnetic field.

Electric and magnetic fields are frequently experienced without most people knowing. Common examples are electric utility poles, household wiring, TVs, computers, electric stoves, etc.

Studies have been conducted over the past 30 years to determine whether an association exists between exposure to magnetic fields and human health.

Studies of animals have not provided any indications that exposure to EMFs is associated with cancer.

The International Agency for Research on Cancer (IARC) found “limited evidence” in humans for the carcinogenicity of EMF magnetic fields in relation to childhood leukemia, with “inadequate evidence” in relation to all other cancers. It found “inadequate evidence” for the carcinogenicity of EMF magnetic fields based on studies in lab animals.

IARC states: “All known human carcinogens that have been studied adequately for carcinogenicity in experimental animals have produced positive results in one or more animal species.” No positive results (causing animal cancers) have been found from magnetic field exposure.

IARC found “inadequate evidence” for the carcinogenicity of EMF’s in humans.
An EMF report completed by the National Institute of Environmental Health Sciences to the U.S. Congress states: “The lack of connection between the human data and the experimental data (animal and mechanistic) severely complicates the interpretation of these results.”

Recognized Guidelines

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) published the following statement “the currently existing scientific evidence does not lead to the conclusion that prolonged exposure to Low Frequency (LF) is a cause of childhood leukemia. Evidence for cancer in adults from LF exposure is very weak. There is no substantial scientific evidence for an association between LF exposure and Parkinson’s disease, multiple sclerosis, developmental and reproductive effects, and cardiovascular diseases, while for Alzheimer´s disease and amyotrophic lateral sclerosis the evidence is inconclusive. Studies of symptoms, sleep quality, and cognitive function have not provided consistent evidence of an effect from this type of exposure. Overall research has not shown to date that long-term low-level LF exposure has detrimental effects on health.”

The ICNIRP reference limits for electric field strength are 8.33 kV/m for occupational exposure and 4.16 kV/m for public exposure.
IEEE C95.6-2002 provides maximum permissible exposure (MPE) levels of 20 kV/m in a controlled environment, 5 kV/m for the general public (edge of ROW), and 10 kV/m within power line ROW under normal load conditions.
ICNIRP reference limits for magnetic fields are 10,000 mG for occupational exposure and 2,000 mG for general public exposure.
IEEE C95.6-2002 provides maximum permissible exposure (MPE) magnetic field levels of 0.904 mT (9,040 mG) for the general public, and 2.71 mT (27,100 mG) in a controlled environment.

Electromagnetic Hypersensitivity (EHS)

Some individuals experience a wide range of nonspecific symptoms such as headaches and sleep disturbance that can be debilitating, which they ascribe to EMF exposure. Further, some of these individuals believe they can sense the presence of high fields that trigger their symptoms. The consensus of the scientific community is that while some of these individuals clearly have health conditions and may be reacting to factors in their environment, their symptoms are not related to EMF. This conclusion is based mostly on carefully conducted laboratory tests in which self-identified EHS individuals could not detect the presence of fields.

Implanted Devices

Pacemakers and other medical devices: Cardiac pacemakers and defibrillators are the most commonly implanted medical devices, and research has indicated that they may be susceptible to interference under certain high field conditions. The sensitivity varies by manufacturer, the design, and how they are used by the patient. Metallic case shielding, filters, and bipolar sensing have contributed to improved immunity to interference. International immunity standards call for implanted medical devices to maintain immunity to power frequency magnetic fields of 1 gauss (1,000mG) and electric fields of 5 kV/m (5,000 V/m).

Occupational Studies

Studies of workers can offer a useful opportunity to examine environmental EMF exposure at higher levels than occur in residential settings. Many occupational studies of electrical workers and others exposed to higher magnetic fields have examined both cancer and other diseases. Overall, those studies do not support a link between magnetic field exposure and any form of cancer or adverse effects. The graph below shows the magnetic field strength comparisons between common household items to high voltage transmission lines.