

# Electric and Magnetic Fields



Duke Energy is committed to safely providing electric service for our customers and ensuring a safe working environment for our employees. The company funds, participates in and monitors research aimed at answering questions and addressing property owners' questions and concerns about electric and magnetic fields (EMF).

- Electric fields are created by voltage. You will find an electric field near any electrical appliance that is plugged in, even when it is switched off. Magnetic fields, by contrast, are created by current or electricity flowing through a wire. So, an appliance must be plugged in and operating to create a magnetic field.
- Because electricity is so common in daily life, most of us are in contact with electric and magnetic fields virtually all the time. Examples include power poles, electrical wiring in buildings, electric motors and appliances, TVs, computers, hair dryers, etc.
- Numerous studies have been conducted over the past 30 years in an attempt to determine whether an association exists between exposure to magnetic fields and human health.
- There have been studies that pointed to some association between EMF and human health, and others that found no association at all. Association does not mean cause and effect.
- Virtually all laboratory studies on animals and cells have failed to establish an association between EMF and human health.
- International Agency for Research on Cancer (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 fields exposure.
- 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." Given the limitations of current scientific knowledge, we are not able to determine the potential effect of EMF on human health.
- Magnetic fields from power substation equipment, measured at the substation fence, are generally negligible. However, measurements at the substation fence can reflect the magnetic fields from nearby power lines entering and exiting the substation and generally do not exceed measured values for overhead transmission and distribution lines located elsewhere.

## Related Topics

Various organizations, including most prominently the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the Institute for Electrical and Electronic Engineers (IEEE), issue guidelines and standards recommending exposure limits that protect against electrostimulation.

### General Public Exposure Limits for Power Frequency Fields

Organization	Magnetic Field (mG)	Electric Field (kV/m)
ICNIRP	2,000	4.2
IEEE	9,100	5.0 (10 on ROW)

Note: The unit of measure for electric fields is volts per meter (V/m). Kilovolts per meter (kV/m) is the unit most commonly used directly beneath transmission lines where the field is typically in the thousands of volts. The unit of measure for the magnetic field is the gauss (abbreviated as G), with exposure expressed in milligauss or mG (1/1,000th of a gauss).



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## 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. In practice, interference is very rare. International immunity standards call for implanted medical devices to maintain an immunity to power frequency magnetic fields of 1 gauss (1,000 mG) 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 chart compares the magnetic field strength at 100 feet from 230-kV and 115-kV lines and the median magnetic field strength 1 foot away from common electrical appliances.

### Magnetic Field Comparisons

