PowerOn Midwest
Big Stone South to Brookings

OTTER TAIL POWER COMPANY Xcel Energy®

The Basics: Electromagnetic Fields



PowerOn Midwest is working with landowners and the community to power our region today and into the future. As power sources evolve and electricity demand grows, PowerOn Midwest is needed to ensure reliable, low-cost electricity for customers.

Modern infrastructure can be integrated safely into everyday life.

There are more than 500,000 miles of transmission lines and millions of miles of distribution lines operating safely and powering homes, schools and businesses in the country today. People living and working near transmission lines may have questions about electric and magnetic fields (EMF). This fact sheet provides general information to help you get started on understanding EMF. For more in-depth information, please refer to the resources list on the back.

The Basics: electric and magnetic fields.

EMF is commonly used as an abbreviation for three technically different but related terms: electric fields from the use of electricity, magnetic fields from the use of electricity, or electromagnetic fields from devices that use radio frequency. Electric fields relate to voltage and magnetic fields relate to current. For alternating-current transmission lines, both electric fields and magnetic fields occur at extremely low frequency (they are non-ionizing). EMF are all around us — from natural sources (like the Earth's magnetic field) and human-made sources (like household wiring and appliances).

Magnetic fields are created by electric current and are present near all devices and wires in which electricity is flowing. Both electric and magnetic fields decrease quickly as the distance from the source increases. A few hundred feet from the proposed transmission lines, electric and magnetic fields are usually indistinguishable from everyday background levels. Magnetic fields are a function of current, geometry, and distance, not of voltage. Electric fields are a function of voltage, geometry, and distance.

EMF at home, school, and work.

EMF are created whenever electricity flows or an electrical force is present. These fields can occur naturally, such as in a person's brain, heart, and muscle. The level of magnetic fields, at 60 Hertz are also produced by everyday household items like space heaters, vacuums, kitchen appliances and electric blankets. The widespread use of electricity means we are exposed to EMF in our everyday environment at work, school, and home.

The following graphics provide magnetic field levels of common household appliances as well as anticipated magnetic fields under the proposed 765 kV line. Expected magnetic field levels from the proposed 345 kV lines are even lower.

MAGNETIC-FIELD LEVELS (IN MILLIGAUSS) MEASURED NEAR HOUSEHOLD APPLIANCES

Hair dryer

6 in. away	12 in. away
300 mG	1 mG

Electric shaver

6 in. away	12 in. away
100 mG	20 mG

Blender

6 in. away	12 in. away
70 mG	10 mG

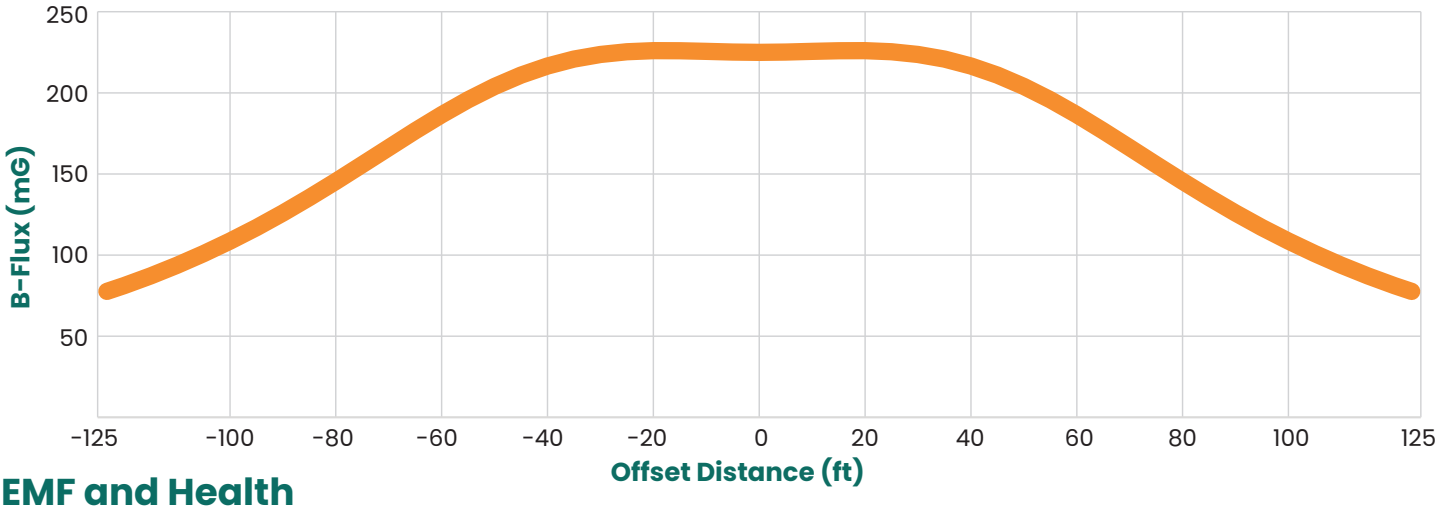
Vacuum cleaner

6 in. away	12 in. away
300 mG	60 mG

Coffee makers

6 in. away	12 in. away
200 mG	40 mG

ANTICIPATED MAGNETIC FIELD LEVELS FOR POWERON MIDWEST 765 KV TRANSMISSION LINE



EMF and Health

EMF from power lines, and their effects on health, have been studied for more than 40 years by governmental bodies, public health organizations, and government appointed scientific panels all over the world. Initially, there were concerns of a possible association between childhood leukemia and magnetic fields of transmission lines. Subsequent research failed to demonstrate a causal relationship between transmission lines and any health risk. The World Health Organization (WHO) and other health agencies have concluded that, at levels of EMF exposure found near transmission lines, there are no known health consequences.

EXPERT SOURCES AND USEFUL LINKS

- International Commission on Non-Ionizing Radiation Protection (ICNIRP). Power Lines – Low Frequency. Available at: https://www.icnirp.org/en/applications/power-lines/index.html. Accessed October 30, 2025.
- National Institute of Environmental Health Sciences; National Institutes of Health. Electric and Magnetic Fields Associated With the Use of Electric Power. 2002. Available at: https://www.niehs.nih.gov/sites/default/files/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf. Accessed October 30, 2025.
- National Cancer Institute. Electromagnetic Fields and Cancer. Available at: https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/electromagnetic-fields-fact-sheet. Accessed October 30, 2025.
- World Health Organization. Electromagnetic Fields. Available at: https://www.who.int/health-topics/electromagnetic-fields#tab=tab_1. Accessed October 30, 2025.