

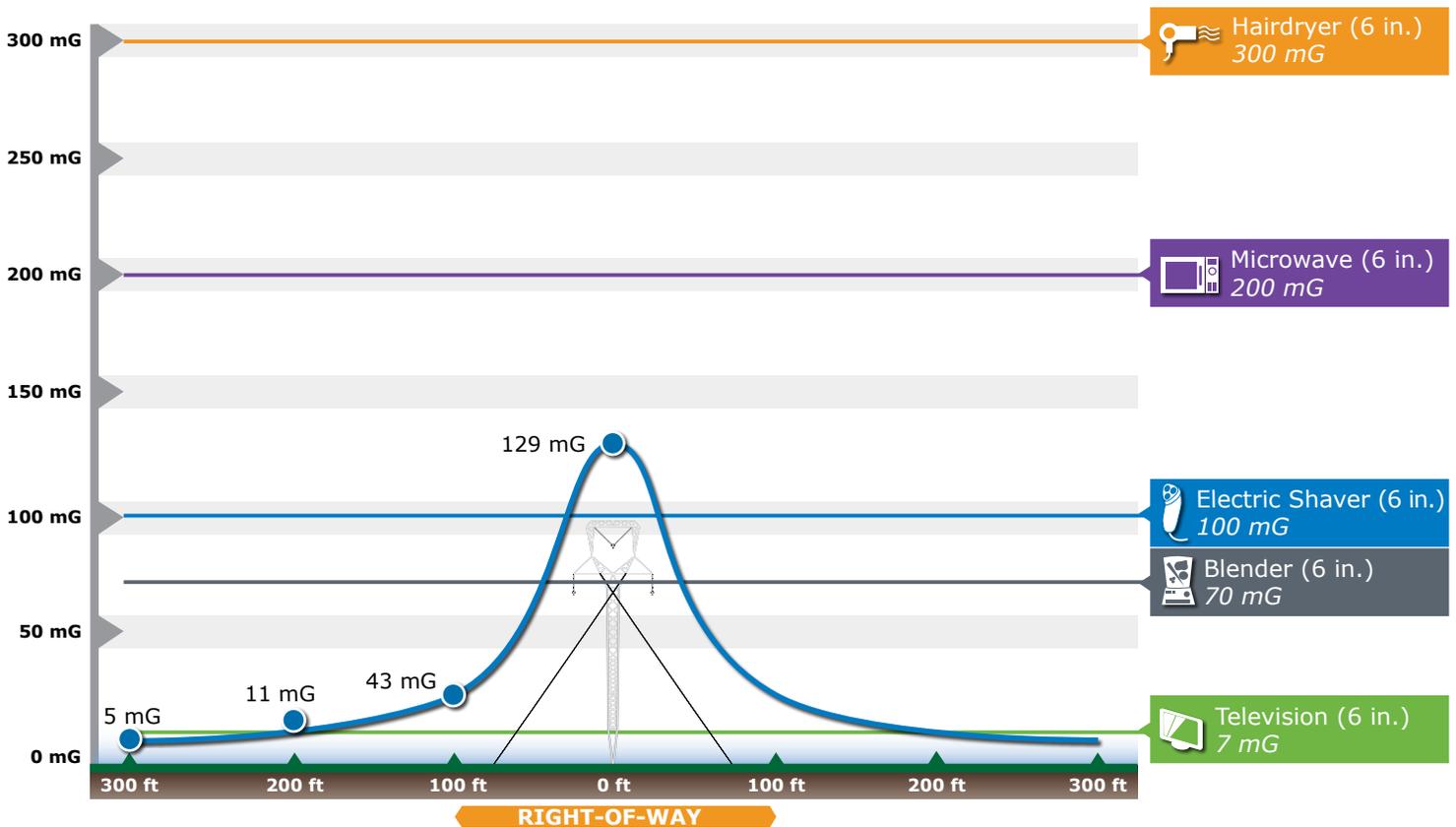
► What is EMF?

“EMF” is a term commonly used to refer to electric and magnetic fields. Electric fields are produced by the voltage on a wire and magnetic fields are produced by the electric current flowing through the wire. EMF are present anywhere electricity is produced or used, including around household appliances, computers, house wiring, and transmission lines. EMF are strongest closest to the wires in which they are produced and their intensity decreases dramatically with increasing distance from the wire. So the farther away you are from the wires, the less EMF reaches you.

The figure below illustrates the magnetic field level on the ground beneath a typical 500 kV transmission line carrying a similar amount of current as what may be expected on the Great Northern Transmission Line during peak conditions. The bell curve shape demonstrates the dramatic decrease in magnetic field strength as the distance from the wires - located in the middle of the right-of-way - increases.

To provide some context for the transmission line magnetic field levels shown in the figure, the magnetic fields associated with several common household appliances are also included in the figure. As shown, the exposure to magnetic fields underneath a 500 kV transmission line is no greater than what might be experienced in the vicinity of these common household appliances.

► Magnetic Fields



*The figure above represents magnetic fields for a comparable 500 kV line and do not necessarily represent the measurements for the Great Northern Transmission Line.

▶ Is the transmission line **magnetic field** exposure hazardous to my health?

The question of whether exposure to transmission line magnetic fields can cause human health effects has been the subject of considerable research over the past three decades. The most recent and exhaustive reviews of the subject have concluded that the evidence of health risk is minimal:

“The Minnesota Department of Health concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects.”

(page 36, A White Paper on Electric and Magnetic Field Policy and Mitigation Options, 2002)

“There is no clear scientific evidence that electromagnetic fields affect health”

(U.S. Environmental Protection Agency: www3.epa.gov/radtown/docs/electric-magnetic-fields.pdf, updated August 2014)

Overhead transmission line rights-of-way exist all around the world, even in densely populated areas and no legitimate public health agency has proposed that an “unsafe” region exists in the proximity of these lines. Public health agencies like the American Cancer Society, U.S. Environmental Protection Agency, U.S. Food and Drug Administration, and the Centers for Disease Control have not set transmission line magnetic field exposure limits because they have not found the scientific studies sufficiently supportive of the need for a numerical exposure guideline or “safe distance” criterion.

▶ Is the transmission line **electric field** exposure hazardous to my health?

Concern over health effects from transmission line electric fields generally falls into three categories: induced voltage, stray voltage, and electrical interaction with implantable medical devices (IMD’s).

When a metal object such as a vehicle or a fence is sitting in an electric field, a voltage will be induced on the object. The main concern with induced voltage is the current that may flow through a person on the ground if the person touches the object and receives an electrical shock. To ensure that transmission line electric fields do not cause hazard-level shocks in such situations, the National Electrical Safety Code and the Minnesota Public Utilities Commission have established strict electrical shock and electric field limits that must be incorporated into the design of all transmission lines, including this Project.

Stray voltage is a condition that can occur at the connection point of structures to distribution lines – not transmission lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the connection point and grounded objects in buildings. Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses and residences. However, transmission lines can induce stray voltage on a distribution circuit that is parallel and immediately beneath the transmission line. Appropriate measures would be taken to prevent stray voltage problems when the Project parallels or crosses distribution lines.

The other type of potential impact of transmission line electric fields is interference with IMD’s such as pacemakers and defibrillators. Pacemaker manufacturers such as Medtronic and Guidant have indicated that modern cardiac devices are much less susceptible to such interactions than older devices. Recent studies have concluded that device interaction due to typical public exposure levels to transmission line electric fields would be very rare.