

Stray voltage



This information has been prepared to provide landowners, agricultural producers, and community members information about stray voltage associated with electric lines. The purpose is to explain what stray voltage is, describe how concerns are typically evaluated, and outline how this project will address the issue in a transparent, data-driven manner.



What is stray voltage?

Defining the term

Stray voltage is defined as a voltage that results from the normal delivery or use of electricity and may be present between two conductive surfaces that can be simultaneously contacted by people or animals. It is not caused by electrical faults on the transmission system.

In agricultural settings, this may occur between surfaces such as metal equipment, waterers, or concrete floors.

Stray voltage is evaluated through measurement over a period of time at locations where people or animals may contact more than one surface at the same time.

Stray voltage vs. Electric shock

Stray voltage is different than electric shock.

- **ELECTRIC SHOCK**

An electric shock occurs when a person or animal comes into contact with an energized source and electrical current flows through the body. This is typically associated with unsafe conditions, faults, or direct contact with energized conductors, and requires immediate correction.

- **STRAY VOLTAGE**

Stray voltage involves small voltage differences and low levels of current that can occur under normal system operation. These conditions are evaluated through measurement and are not, by itself, an indication of a fault or unsafe condition.

Stray voltage – quick overview



What is it?

Small electrical differences that can exist between two conductive surfaces that animals or people may contact simultaneously.



How are concerns evaluated?

Concerns are evaluated using measurements taken over time under normal operating conditions.



What happens if it is found?

The source is identified and addressed based on measured data.

Potential sources

Stray voltage may result from one or multiple contributing factors within an electrical environment. Common contributing factors include the following:

- **ON-SITE ELECTRICAL SYSTEMS**

Wiring, equipment, electrical loads, grounding, and bonding systems influence how electrical current flows.

- **ELECTRIC DISTRIBUTION SYSTEMS**

Neutral current flows as part of normal electric service and may contribute to voltage differences.

- **PHYSICAL CONDITIONS AND NEARBY ELECTRICAL INFRASTRUCTURE**

The arrangement of conductive materials (such as fences, metal structures, or pipelines), as well as nearby energized facilities, can influence measured voltages, including effects associated with electrical induction.



Animal behavior

Changes in animal behavior, such as hesitation near waterers or feeders, nervousness, or changes in production, can have many causes, including:

- Herd health
- Nutrition
- Facility conditions
- Equipment operation
- Environmental factors

These observations are important and often lead to evaluations and formal measurements of the electrical system. Such measurements are used to determine whether stray voltage may be a contributing factor.



How stray voltage concerns evaluated

Evaluation is often based on measurements using appropriate tools and techniques.

MONITORING OVER TIME

Measurements are collected over a period of time to reflect normal operating conditions.

REPRESENTATIVE LOCATIONS

Testing is performed where people or animals may contact multiple surfaces.

STRUCTURED PROCESS

Investigations follow a step-by-step approach to determine whether stray voltage is present and to identify contributing sources.



Corrective actions

Corrective actions depend on the measured source of contributing factors.

ON-SITE CONDITIONS

Actions may include improvements to wiring, grounding, and bonding systems.

UTILITY-RELATED CONDITIONS

Mitigation is implemented in coordination with the serving utility using established engineering methods.

Project-specific approach

The Applicants will construct the Project in accordance with applicable permit requirements to minimize impacts, including the electrical performance standards established by the Public Utilities Commission.



ADDITIONAL REFERENCES:

Minnesota Stray Voltage Guide (2015)

A collaborative guide developed by utilities, agricultural organizations, and state agencies outlining procedures for evaluating and addressing stray voltage concerns

<https://www.minnesotastrayvoltageguide.com/>