

State Rulings on Noise and Electro Magnetic Fields (EMF):

Pawnee-Daniels Park 345 kV Transmission Line Project

Xcel Energy's proposed Pawnee-Daniels Park 345 kV Transmission Project consists of new 345kV transmission lines between the utility's Pawnee Substation in northeastern Colorado and the Daniels Park Substation south of the Denver metro-area. It will likely interconnect with the existing Missile Site Substation (near Deer Trail) and include construction of a new electric substation in Arapahoe County, just east of the Smoky Hill Substation.

The project is proposed under Colorado Senate Bill 07-100, legislation that was designed to foster development of electric infrastructure in Colorado. It's been a part of the company's long-range transmission plans since 2007.

The Pawnee-Daniels Park Transmission Line Project will create a more robust and reliable electricity system to serve the state's growing demand for cost-effective energy. Since the project ties together energy resource zones with high potential for clean and renewable energy, customers will benefit further from the interconnection and delivery of new generating resources—including more wind and natural gas—to the Front Range.

About The Process

When a utility is seeking authority to construct, extend or operate a facility such as this, they must file for a Certificate of Public Convenience and Necessity (or a CPCN) with the Colorado Public Utilities Commission (CPUC).

Xcel Energy filed for a CPCN for the Pawnee-Daniels Park 345kV Transmission Line Project in March 2014. As part of the regulatory approval process, the Commission sets standards for the reasonableness of noise levels and electro magnetic fields (EMF). Xcel Energy is required to meet state standards for both as outlined in the Code of Colorado Regulations (Section 4 CCR 723-3).

In a decision issued March 11, 2015, the Commissioners and staff agreed that the EMF and noise levels for the Pawnee-Daniels Park project were both reasonable and acceptable.

Noise Mitigation

In the CPCN process, we consistently consider ways to effectively mitigate noise associated with transmission facilities and substations. In this application, Xcel Energy included studies addressing potential noise levels (expressed in decibels). We modeled and measured project noise levels radiating beyond the property line or transmission right of way, plus an additional 25 feet, as outlined in the code.

The Residential Zone threshold is the most stringent in any defined zone. Based on code requirements, noise measured at 50 decibels or less beyond the property line or right of way

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Learn more about the project at Transmission.XcelEnergy.com.

For additional details about the Code of Colorado Regulations visit sos.state.co/US/CCR.

- Commission Electric Rule 3102 (c) set reasonable estimated noise levels.
- Commission Electric Rule 3206 (f) sets guidelines for corona levels.
- Commission Electric Rule 3102 (d) sets acceptable levels for magnetic field levels.
- Commission Electric Rule 3206 (e) (Magnetic Fields) defines the loads used to calculate transmission line magnetic fields.

(as applicable) at a distance of 25 feet in a Residential Zone is deemed reasonable. Noise measured at 55 decibels beyond the property line or right of way (as applicable) at a distance of 25 feet in a Commercial Zone is also deemed reasonable.

Mitigation Measures

To help mitigate noise, Xcel Energy designed this project using low-corona hardware on transmission lines. Alternate phasing arrangements also reduce noise. Corona is what creates hissing, crackling, or popping sounds emanating from transmission lines, and generally increases with voltage. Corona is a small electrical discharge, not unlike the static electrical charge that you may experience touching a metal object when walking on carpet.

All high-voltage transmission lines experience significant corona during wet weather, when water droplets form on the line. In normal, fair weather conditions, corona and its corresponding audible noise are usually at low levels (approximately 25 decibels less than wet weather noise). Corona also increases approximately 1 decibel for every 1,000 feet in elevation gain.

Commission Findings

Xcel Energy projected audible noise levels for each section of the project (under both fair and wet & rainy weather conditions). The noise levels modeled for each Residential Zone section were less than 50 decibels and Commercial Zone sections were 50.5 decibels.

CPUC staff reviewed Xcel Energy’s studies for all sections of the project and supported a finding that the noise levels for all sections were deemed reasonable. No party has contested Xcel Energy’s testimony in support of these findings.

Decibel Level Reference Chart

Decibel Level – dB(a) Examples	
120-130	Pneumatic Chipper
110-120	Loud audible horn (1 mile distance away)
90-100	Inside subway (New York)
80-90	Inside motorbus
70-80	Average traffic on street corner
60-70	Conversational speech
50-60	Typical business office
40-60	Living room, suburban area
30-40	Library ambient noise
20-30	Bedroom at night
10-20	Broadcasting studio
0-10	Threshold of hearing

Courtesy: Electric Power Research Institute

Electro Magnetic Fields (EMF)

EMF exists wherever electricity is produced or used, and EMF surrounds any electrical appliance of wire that is conducting electricity. Everyone is exposed to these fields at home when you turn on a lamp, email a friend, or use an electric oven or microwave to cook your dinner. The frequency of fields produced by electricity transmission—typical of power lines—is low, and electric and magnetic fields exist separately.

Magnetic fields, measured in milliGauss (mG), are produced by electric current and only exist when an electric appliance is turned on—the higher the current, the greater the magnetic field. As with electric fields, the strength of a magnetic field dissipates rapidly as you move away from its source.

Colorado has not established field exposure limit values for magnetic fields, as measured at the edge of a project’s right of way. By comparison, New York has adopted a value of 200 mG for any transmission line, regardless of voltage. The American Conference of Governmental Industrial Hygienists has set a not-to-exceed value of 10,000 mG for occupational exposure and 1,000 mG for those workers with pacemakers. The International Commission on Non-Ionizing Radiation Protection has set exposure limits of 833 mG for the general public.

Xcel Energy requested that the Colorado PUC approve 150 mG to be a reasonable level for this project. We believe this is a reasonable level based upon past Commission action and standards adopted by others.

Mitigation Measures

Our engineering team designed the Pawnee-Daniels Park 345kV Transmission Line project to incorporate two measures to help mitigate magnetic fields:

- Arranging phasing conductors in a configuration to reduce magnetic fields (and noise).
- Increasing the height of transmission structures (an extra five feet more than required) to reduce the magnetic field at ground level.

Commission Findings

The Commission determined that undergrounding transmission lines was not warranted due to increased costs and construction impacts. Additionally, burying transmission lines would not eliminate magnetic fields.

CPUC staff reviewed each section of the project and found expected magnetic field levels to be less than 150 mG at the edge of the transmission line right of way at one meter above the ground.

Based on Commission rules, prior findings and comparative standards, Xcel Energy has shown that the project has been designed to avoid magnetic fields. The CPUC also determined the magnetic levels, measured as described above, are reasonable. No party has contested Xcel Energy’s testimony in support of these findings.