# Impacts of AC Interference on Natural Gas Infrastructure

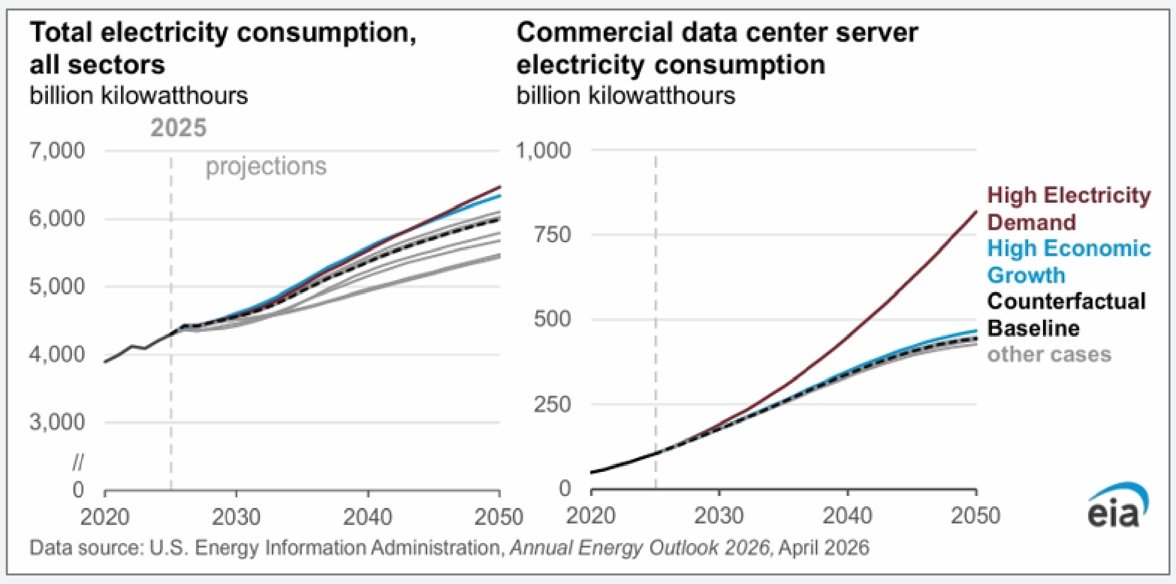
GTI ENERGY center for METHANE RESEARCH

## Introduction

Alternating Current (AC) is a type of electric current that reverses direction periodically and is widely used when powering infrastructure.

**Alternating Current (AC) Interference** is a broadly impactful phenomenon that occurs when AC from one source induces an undesirable voltage onto neighboring metallic infrastructure, such as natural gas and water pipelines. The presence of AC interference can contribute to increased corrosion rates and operational disruptions. AC interference can also pose safety risks when pipeline operators are exposed to unexpected, increased voltages resulting from stray current onto pipeline infrastructure. These safety risks can increase dramatically during episodic events such as lighting strikes to power lines.[7]

The topic of AC interference has become increasingly important as major upgrades to electric infrastructure ramp up in the United States. In March of 2026, the U.S. Department of Energy's Office of Electricity announced a new funding program: Speed to Power through Accelerated Reconductoring and other Key Advanced Transmission Technology Upgrades (SPARK). This funding opportunity aims to assist the growth of electricity infrastructure through reconductoring with advanced conductors, large-scale, cross regional transmission upgrades, and Advanced Transmission Technologies.[1] These upgrades are intended to prepare the grid for increasing demand through 2050, which is further driven by expected consumption increases from data centers.




## Potential Sources of AC Interference:

***High-voltage power lines*** and gas pipelines are often placed in the same right-of-way to simplify economics and utility passage. These collocation pathways have the highest potential for AC interference to affect pipelines. The U.S. power grid is currently facing severe bottlenecks and power strain, and rapid updates are needed to keep up with demand. Reconductoring existing power lines is considered the most cost-effective means of upgrading grid capacity, which entails retrofitting traditional steel core transmission cables with newer, advanced conductors which have a composite core. These advanced conductors can carry about twice the voltage capacity of current traditonal cables.[2]

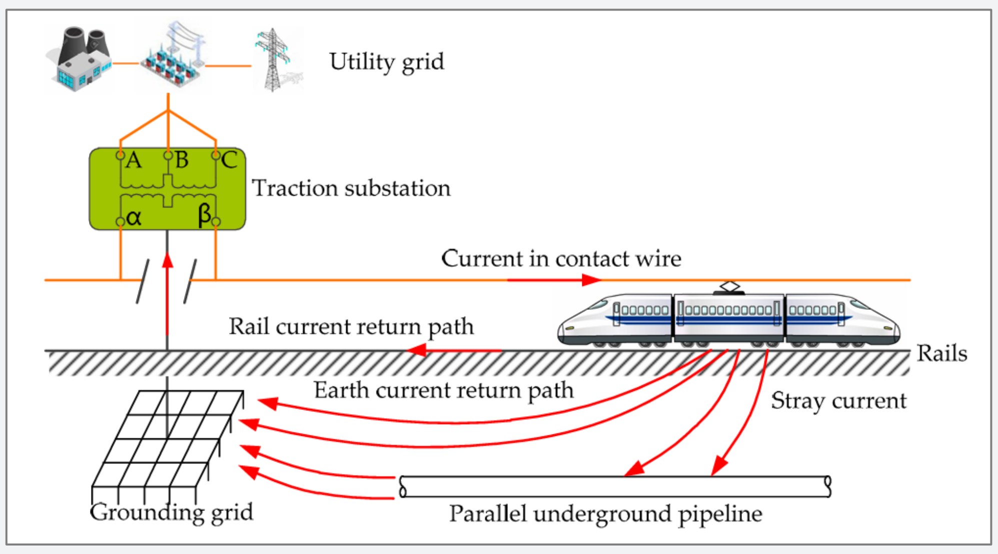
| Common Electric Infrastructure | Typical Voltage |
|---|---|
| Ultra-High Voltage Transmission Lines | Above 800 kV |
| High-Voltage Transmission Lines | 115 kV – 765 kV |
| Sub-Transmission Lines | 34 kV – 69 kV |
| Electric Distribution Lines | 7 kV – 13 kV |
| EV Level 1 Chargers | 120 V |
| EV Level 2 Chargers | 208 V – 240 V |
| EV DC Fast Chargers | 400 – 1000 V DC |
| AC Railway Systems | 25 kV – 50 kV |

*The most important metric with respect to AC interference, is the current density over a specific area, which varies with voltage and resistance (V=IR). While higher voltage is often considered to contribute larger AC interference impacts, proximity to neighboring infrastructure can be additionally impactful.*

***Cathodic protection (CP) systems*** (and pipe coatings) are widely used to protect steel pipelines from corrosion and act as first lines of defense against stray current. However, several factors can impact the corrosion mitigation abilities of cathodic protection systems such as proximity to AC sources, pipe coating integrites and, soil resistivities. Although cathodic protection systems can mitigate stray current impacts, they may also be a source of stray current for neighboring infrastructure.

***Electric vehicle (EV)*** charging stations and roadways are also a potential source for AC interference. EV charging stations rapidly switch from AC to DC, which causes harmonic distortion. Harmonic distortion can cause damage to EV charging cables and voltage distortion.[4] It is not yet well understood how voltage distortion and AC from EV charging stations could impact pipeline infrastructure.

***Electric railways*** are less common than transmission lines, but have strong currents and when they are located near pipelines there is a chance for AC and DC (direct current) interference. In electric railway systems, the current uses the rail as well as the earth to flow back to the traction substation, which leads to stray current flowing through the pipeline, especially in low soil resistivity.[5]




Source: [5]

## Ongoing Research

Natural gas operators deploy several methods for identifying and mitigating AC interference impacts. A major aspect of this effort is identifying where AC interference is most likely to occur. Previous analysis conducted by GTI Energy has explored how different pipeline coatings, pipeline age, and cathodic protection conditions may affect pipe leak trends. This analysis noted the challenges with diagnosing AC interference, especially due to measurement challenges.

For instance, AC can build up along a pipe, and the current density can become very high at small pits or coating defect points, which are where AC corrosion can do the most damage. Previous studies have found that CP protected pipelines can have AC corrosion damage occur at AC voltages lower than the NACE recommended safe threshold of 15V.[6] Lab and field results have shown that AC current density of 50-100 A/m$^2$ can have a severe risk of corrosion rates at small holidays (defects in the pipe's protective coating). For perspective: at a holiday with 1cm$^2$ surface area, and a low soil resistivity of 10 ohm-m, only 4.4V is needed to produce a current density of 100 A/m$^2$.[6]

## Recommendations

Stray current is not a siloed issue and impacts various types of infrastructure. Mitigating the impacts of AC interference will require a multi-level approach to address 1) timely detection, 2) effective mitigation, and 3) preventative infrastructure planning. More research is needed to understand the scope of the issue. Specifically, how AC interference issues will evolve with changing infrastructure and evaluation of emerging mitigation technologies.

Since many pipelines must operate in high-traffic areas like utility and public transit corridors, additional mitigation and planning strategies continue to be prioritized in these areas. Pipeline operators will be placed with the onus of understanding how to ensure continued safety and reliability of pipeline infrastructure as electric infrastructure continues to grow.


**For more information, contact methane@gti.energy.**


GTI ENERGY
solutions that transform


[1] U.S. Department of Energy Office of Electricity. (2026). Speed to Power through Accelerated Reconductoring and other Key Advanced Transmission Technology Upgrades (SPARK). https://www.energy.gov/oe/speed-power-through-accelerated-reconductoring-and-other-key-advanced-transmission-technology
[2] E. Chojkiewicz et al. (2024). Accelerating transmission capacity expansion by using advanced conductors in existing right-of-way. Proceedings of the National Academy of Sciences, 121(40). https://doi.org/10.1073/pnas.2411207121
[3] E. M. Farahani et al. (2023). AC Corrosion of Steel Pipeline under Cathodic Protection: A state-of-the-art review. Materials and Corrosion, 75(3), 290–314. https://doi.org/10.1002/maco.202313955
[4] M. Sabarimuthu et al. (2021). Measurement and analysis of power quality issues due to electric vehicle charger. IOP Conference Series: Materials Science and Engineering, 1055(1), 012131. https://doi.org/10.1088/1757-899x/1055/1/012131
[5] Chen, M., Liu, S., Zhu, J., Xie, C., Tian, H., & Li, J. (2018). Effects and characteristics of AC interference on parallel underground pipelines caused by an AC electrified railway. Energies, 11(9), 2255. https://doi.org/10.3390/en11092255
[6] Allen, R. F. Appalachian Underground Corrosion Short Course. Ark Engineering. https://aucsc.com/_aucsc%20speaker%20files/TT06%20-%20AC%20Corrosion%20Issues-2012-AUCSC.pdf
[7] X. Wang et al. (2023). Study of transmission line AC interference with steel-buried pipelines under lightning strikes. Electric Power Systems Research, 218, 109226. https://doi.org/10.1016/j.epsr.2023.109226