



CORROSION ON UNDERGROUND POWER TRANSMISSION CABLES

OUR SOLUTIONS

Underground power transmission cable systems are installed in congested areas or locations where overhead electrical lines may not be feasible due to construction, right-of-way (ROW), or regulatory constraints. There are four main types of underground cable systems, each with its unique corrosion challenges:

1. High-pressure, fluid-filled pipe (HPFF)
2. High-pressure, gas-filled pipe (HPGF)
3. Self-contained, fluid-filled pipe (SCFF)
4. Solid dielectric insulated cable

Pipe-type cables are enclosed in metallic pipes containing three copper or aluminum conductors, each with insulation and metallic shielding. These pipes are then filled with dielectric oil or gas to

allow for heat dissipation and additional electrical insulation. For fluid-filled pipes, the dielectric oil is usually pumped by stations located within electrical substations; they may also include heat exchangers for fluid circulation systems.

Since the pipes are metallic, they are subject to external corrosion. This corrosion can be due to changes in the soil or water environment due to chemistry or changes in soil resistivity. They are also subject to stray currents from nearby cathodically-protected infrastructures (DC currents) or nearby electrical transmission infrastructure (AC currents). Prevention of external corrosion involves coating applications or cathodic protection systems.

Long-term corrosion of the metallic pipe will result in leaking dielectric oil, reducing the heat and electrical insulation properties. If these are not remedied, then the circuit is at increased risk of failure. Maintenance programs often involve periodic surveys of the pipe-type cable itself and the cathodic protection systems.

Cross-linked Polyethylene cable (XLPE) may have periodic splice pits or vaults with their own localized grounding systems. These grounding systems are also subject to stray DC and AC currents from nearby infrastructure, which could result in external corrosion.

EN Consulting's corrosion engineering group has extensive experience with cathodic protection and interference studies for buried pipe-type cables and grounding systems. We leverage our experience from the oil and gas industry to provide solutions for the electric transmission and distribution groups with their corrosion control and maintenance design.



SERVICES

- Soil resistivity measurements
- Close-interval survey (CIS)
- Coating surveys (ACVG, DCVG, PCM)
- AC and DC interference studies
- Site evaluations
- Periodic surveys and inspections
- Cathodic protection design
- Electrical grounding design
- Modeling services by SES CDEGS, ROW-Pro, and Multifields+ modules
- Evaluation against operator limits or regulatory controls
- Consulting services to modify designs as needed
- Professional Engineer (PE) review and seal