

AT A GLANCE

Extruded Dielectric Cable Systems

Program 36, Project 36.002

Research Value

- Validate and improve theoretical understanding of the thermo-mechanical behavior of extruded dielectric transmission cables.
- Support improved specifications and standardized designs, leading to higher system reliability, fewer circuit outages, and lower life-cycle costs.
- Assist in asset management, improve utility operation efficiency, and increase system reliability.
- Improve design, inspection, maintenance, and protection.
- Deepen industry's understanding of system performance and help determine end-of-life criteria.

Member Benefits

- Improve productivity and reduce costs of designing, installing, commissioning, testing, operating, and maintaining extruded dielectric cable systems.
- Achieve effective and economical system designs.
- Deploy new inspection and monitoring methods and tools to obtain real-time and near-real-time information on cable system conditions.

Utilities rely on extruded dielectric cable systems to meet growing demands for new underground transmission lines. This project intends to address several key research issues, with specific goals including:

- Improve engineering-based design and installation procedures to accommodate electrical, mechanical, and thermal requirements for long-term performance, considering thermo-mechanical behaviors of cables and accessories as well as corrosive environments of buried or in-manhole components.
- Develop effective inspection and monitoring methods for cable system condition assessment.
- Achieve a better understanding of cable and component aging, failure mechanisms, and end-of-life criteria.

This project investigates methods and technologies for extruded dielectric transmission cable systems. Solutions are applicable to design, selection, installation, commissioning, testing, operation, and maintenance of these systems. The project seeks to answer research questions and addresses industry issues through the following activities:

- Laboratory testing to validate engineering design models.
- Laboratory testing to understand failure mechanisms and end of life.
- Development and evaluation of innovative inspection and assessment tools, methods, and technologies.
- Laboratory testing and field demonstration of developed or available diagnostic methods.

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Research Highlights



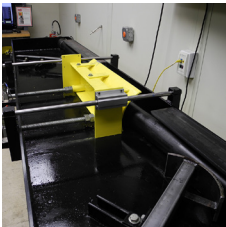
Guidelines for Thermo-Mechanical Design of Extruded Dielectric Cable Systems

- This multi-year task builds on and continues EPRI's prior research in laboratory verification of thermo-mechanical behavior of extruded dielectric cables in ducts, pipes, and manholes.
- The report will include development of a validated source of practical engineering knowledge to assist cable engineers in designing extruded dielectric cable systems with respect to their thermo-mechanical effects.
- The report covers cable mechanical parameter measurements, finite element analysis modeling, engineering software tools, full-scale laboratory validation, applications at utility sites, and subject matter training.



Advanced Sensors and Inspection Techniques for Extruded Dielectric Transmission Cable Systems

- This multi-year task is a continuation of the study on advanced sensors and monitoring techniques for inspection of cable system condition and operational status.
- The task covers developments of test rigs and performs tests to evaluate the effectiveness of available technologies and to demonstrate emerging technologies.
- Field trials on host utility cable circuits may be included to demonstrate technologies and collect measurement data from the fields.



Aging Characteristics of Extruded Dielectric Cable Systems and Components

- Many extruded dielectric cable circuits are approaching 30-40 years in service. There is a need to develop an approach to study their management and life expectancy.
- This task is a series of laboratory experiments to better understand extruded dielectric cable system aging and failure mechanisms.
- The aging tests are to include both land and submarine cables, and accessories of different designs at different transmission voltage levels.



Underground Transmission Vault Corrosion: Inspection Assessment and Remediation

- This task addresses common corrosion issues within underground extruded dielectric cable joint vaults.
- The report discusses corrosion mechanisms within the vaults and provides inspection and assessment results on components within the vaults.
- It also provides remediation recommendations based on results of field inspections and laboratory testing.



Asset Vintage Guide for Extruded Dielectric Cables, Terminations, and Joints

- How an asset degrades and fails is often dependent on how the asset was designed and manufactured.
- This task develops and updates vintage information for component materials, design, manufacturing, and other known issues of extruded dielectric cable systems.



Technology Review of Extruded Dielectric EHV Cable Systems, 220 to 500 kV

- This task is to build on prior EPRI studies on the same topic and provide a state-of-art technology review to assist utility cable users in making engineering decisions for reliable and cost-effective in-service operations.
- The report captures evolving technologies, success and failure experience, and lessons learned to enforce the needs for continuous vigilance during design, manufacturing and installation processes of both cables and accessories.

For more information, contact:

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