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Underground Transmission (P36)

The Underground Transmission Program focuses on assisting utilities in resolving challenges related to design, construction, installation, operation, and maintenance of underground transmission systems consisting of extruded and laminar dielectric cables and accessories. The program develops tools and methods to more effectively design and operate underground transmission systems, gains timely knowledge on asset conditions and life expectancy, and acquires strategic intelligence on emerging technologies.

PROJECT	2025 Accomplishments & Key Deliverables	2026 Plan
P36.001 Design, Construction, Ratings, and Operation and Maintenance of Underground Transmission Systems	• Enhanced Underground Transmission Workstation (UTW) software and included a completely tested Fault Current Calculation module. • Published a series of documents to support the use of UTW and other engineering practices. • Published a series of documents in underground transmission construction and installation practices (grouting, tunnel, etc.) • Investigated EPRI pipe-type to extruded cable conversion concept; assisted and reported progress on a demonstration project at a utility site. • Completed demonstrations of EPRI robotic underground vault inspection techniques at one utility site and improved inspection procedures with additional temperature measurement capability. • Performed forensic analyses on components provided by member utilities and shared experience with members. Key Deliverables: a total of (21) different documents are published under this project, providing support on life-cycle management of underground transmission systems.	• Continue enhancements to Underground Transmission Workstation (UTW) software. • Provide additional documents to support the use of UTW and other engineering practices. • Continue investigating pipe-type to extruded cable conversion, focusing on performing verification tests on EPRI cable design concepts and field demonstrations. • Enhance EPRI robotic inspection techniques for underground vaults and perform more demonstrations. • Continue updating EPRI construction and installation practice manual and other related documents. • Perform additional forensic analysis on components provided by utilities and share experience with member group.
P36.002 Extruded Dielectric Cable Systems	• Completed second phase of long-term thermo-mechanical aging tests on a 230-kV cable with copper corrugated sheath. Started thermo-electrical aging tests at KEPCO Laboratories. • Completed cable mechanical bending parameter tests on one 3-core and one single-core submarine cables. • Operated EPRI outdoor 138-kV aging test rig with two terminations, a joint, a cable section, and two PD monitoring systems. Replaced the existing dry-type termination with a dry-type by another manufacturer for continuous aging tests. • Updated and published EPRI Guide on Extruded Transmission Cable System Condition Monitoring and Diagnostics. Key Deliverable: 3002032846 to 3002032850 Life Evaluation and Management of Extruded Dielectric Cable Systems and Components.	• Continue thermo-mechanical aging tests on a 230-kV cable with copper corrugated sheath. Complete thermo-electrical aging tests at KEPCO Laboratories. Start material aging test protocols. • Perform mechanical parameter tests on a transmission cable with aluminum corrugated sheath. • Continue operating EPRI outdoor 138-kV test rig and evaluate performance of existing components, newly installed dry-type termination, and PD and other cable diagnostic techniques. • Continue building optical fiber test loops in EPRI Charlotte Laboratory for study of DTS, DAS, and DSS technologies.

PROJECT	2025 Accomplishments & Key Deliverables	2026 Plan
P36.003 Laminar Dielectric Cable Systems	• Completed study on buried steel pipe corrosion, focusing on measurement system verifications and procedures for field applications. • Completed study on implementation of developed corrosion protection monitoring systems. • Published a series of documents on pipe-type cable system buried steel pipe corrosion, including fundamentals, practices, EPRI pipe test facility and results, corrosion monitoring system development and testing, and field assessment approach and case studies. • Updated pipe-type cable vintage guide by including historical information on high-pressure gas-filled installations. • Updated guideline documents on dissolved gas analysis and on cable insulation paper and fluid testing by including more case studies. Key Deliverable: 3002032851 to 3002032855 Pipe-type Cable System Buried Steel Pipe Corrosion.	• Continue study on buried steel pipe corrosion and publish results as categorized in the areas of fundamental and practices, test facility and results, coating test results, monitoring development, field assessment, and training. • Continue study on life evaluation and management of laminar dielectric cable systems in areas of general approach, vintage experience, insulation paper and fluid testing, and dissolved gas analysis. • Continue study on failure root cause of laminar dielectric cables; expand EPRI laboratory on tests of paper insulated cable samples received from utility members, including cable dissection, bending test, moisture, dissipation factor, and ac breakdown measurements.
P36.006 Principles and Practices for Underground Transmission	• Held two workshops: Forensic Analysis, Monitoring, and Inspection of Transmission Cables and Accessories, and Underground Transmission Cable Circuit Ampacity for Large Load Centers. • Published new edition of EPRI Underground Transmission Systems Reference Book (The Green Book) and its training proceedings. • Published new edition of EPRI Increased Power Flow Guidebook (The Platinum Book). Key Deliverable: 3002032865 Underground Transmission Cable Circuit Ampacity for Large Load Centers - Workshop Proceedings.	• Provided training sessions on special topics selected based on member interests. • Continue updating select chapters of the Underground Transmission Systems Reference Book (The Green Book). • Continue updating EPRI Underground Transmission Systems Reference Book training proceedings • Continue updating EPRI Increased Power Flow Guidebook. • Update and publish EPRI Framework for Comparison of Overhead and Underground Power Transmission.
P36.008 HVDC Cable and HVAC Submarine Cable Systems	• Updated EPRI High Voltage Direct Current (HVDC) Transmission Reference Book (the Olive Book). • Enhanced UTW-DC software for HVDC cable rating calculations. • Published multi-year joint research results with KEPCO on off-line fault location systems. • Updated report on HVAC and HVDC array and export power cables for offshore wind farms. • Performed initial corrosion studies. • Performed mechanical bending tests on 3-core and single core submarine cables. Key Deliverable: 3002032884 Off-Line Fault Location Systems for Transmission Cables.	• Update EPRI High Voltage Direct Current (HVDC) Transmission Reference Book. • Enhance UTW-DC software for HVDC cable rating calculations. • Continue study and application of joint research results with KEPCO on off-line fault location systems for transmission AC and DC transmission cables. • Continue updating EPRI guide on HVAC and HVDC array and export power cables for offshore wind farms. • Continue performing study on submarine cable corrosion.

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