NEWGEN

Press Release

# NEWGEN Project Concludes Four Years of Research, Advancing the Next Generation of Reliable and Resilient HVDC Cable Systems

**Tampere, Finland, October 2026** – The EU-funded NEWGEN project has concluded four years of research and innovation to advance the next generation of high-voltage direct current (HVDC) cable systems. Bringing together ten partners from five European countries, the project has developed innovative insulation materials, advanced manufacturing approaches, condition-monitoring solutions, and reliability models to support the future of electricity transmission.

HVDC cable systems are essential for transmitting large amounts of electricity over long distances and integrating renewable energy into interconnected power grids. NEWGEN addressed key challenges across the entire extruded HVDC cable value chain through four research work packages, from material development and cable manufacturing to condition monitoring and cable system reliability.

## Key achievements across four work packages

### *WP1 – Space-charge mitigation in polymeric HVDC cable insulation*

Led by VTT Technical Research Centre of Finland (VTT) in collaboration with the University of Twente (UT), WP1 developed innovative polypropylene-based thermoplastic insulation compounds and space-charge-mitigating additives. VTT focused on compound development and production, while UT contributed to chemically functionalized polymeric additive design. Tampere University (TAU), SuperGrid Institute (SGI) and the University of Bologna (UBO) supported material screening and electrical characterisation, and Maillefer (MAI) supported VTT in scale-up and preparation of compounds for cable manufacturing. These advances support the development of recyclable thermoplastic alternatives to conventional crosslinked polyethylene (XLPE) cable insulation, contributing to more sustainable HVDC cable technologies while addressing demanding electrical performance requirements.

### *WP2 – Reliable-by-design manufacturing of HVDC cables*

Led by Maillefer (MAI), WP2 advanced thermoplastic HVDC cable manufacturing through extrusion process development and the production of model cables and life-size HVDC cable prototypes, in collaboration with VTT. Material and dielectric characterisation of cable peelings and specimens was performed by TAU and VTT, while SGI performed mini-cable testing. UBO and Doble Engineering (TAG) supported the analysis. GreenDelta (GD) assessed environmental performance through life-cycle assessment (LCA). The results provide valuable knowledge supporting further industrial implementation.

### *WP3 – Novel pre-fault monitoring solutions for HVDC cables and accessories*

Led by Doble Engineering, WP3 advanced monitoring and diagnostic solutions for detecting potential HVDC cable faults before failure. TAG developed HVDC partial-discharge characterization and global online monitoring, while UBO supported integration with cable life and reliability models. A novel magneto-optic method for leakage current detection was developed by SGI. The partners validated a commercial partial-discharge monitoring product for DC conditions, developed a leakage-current sensor, and integrated these technologies into a monitoring platform. Laboratory tests demonstrated the potential to detect partial-discharge activity and correlate diagnostic signals with operating conditions. Further field validation will be needed to advance these solutions towards practical deployment.

### *WP4 – Tools and models for reliable and resilient HVDC cable systems*

Led by UBO, WP4 developed and validated algorithms to estimate HVDC cable and cable system lifetime and reliability under electrical and thermal stresses, including current load cycles and voltage transients. TAU, SGI and Doble contributed to accelerated lifetime testing and investigations linking monitoring data with cable ageing. The algorithms apply to both XLPE- and polypropylene-insulated cables, including accessories. Moreover, work by Terna and UBO demonstrated HVDC links' resilience against disturbances originating from both AC and DC networks.

## Project Impact and Future Perspectives

The project results provide a foundation for further research, industrial qualification, and commercial exploitation. Future work will focus on field validation of monitoring technologies, refinement of diagnostic and lifetime prediction models, and further development of thermoplastic insulation materials and manufacturing procedures. Together, these advances can support future HVDC cable systems designed for increasing voltage and power requirements while contributing to Europe's energy transition.

Over four years, NEWGEN has also contributed to scientific knowledge through 27 research publications and international conference presentations. Although the project has officially concluded, work will continue to build on and exploit its results. Further testing, field validation and collaboration with industry will be essential to translate the outcomes into practical applications and fully realise their potential.

## About NEWGEN

NEWGEN is an EU-funded research and innovation project dedicated to developing the next generation of reliable and resilient HVDC cable systems. Its four research work packages address space-charge mitigation in polymeric HVDC cable insulation, reliable-by-design cable manufacturing, novel pre-fault monitoring solutions for HVDC cables and accessories, and tools and models for reliable and resilient cable systems. By integrating advances in materials science, manufacturing, diagnostics and reliability modelling, NEWGEN contributes to the development of future HVDC transmission technologies with improved performance and sustainability.

The NEWGEN consortium comprises ten partners from five European countries:

- VTT Technical Research Centre of Finland (VTT) – Project coordinator; Thermoplastic HVDC cable insulation materials research, clean compounding and NEWGEN project coordination.
- University of Twente (UT) – Development of chemically functionalised polymers and space-charge-mitigating additives.
- Maillefer (MAI) – HVDC cable manufacturing technologies and optimization of machinery for thermoplastic insulation.
- GreenDelta (GD) – Life-cycle assessment and sustainability analysis.
- Doble Engineering (TAG) – Partial-discharge monitoring and diagnostics solutions
- University of Bologna (UBO) – Cable lifetime and reliability modelling, and dielectric characterization
- Tampere University (TAU) – Dielectric characterisation and accelerated life time (ALT) testing.
- SuperGrid Institute (SGI) – HVDC cable testing, dielectric characterisation and leakage-current monitoring.
- Terna (TRI) – Assessment of HVDC cable links and their impact on electricity transmission system reliability.
- CLIC Innovation (CLIC) – Communication, dissemination and exploitation

For more information, please contact us at: NEWGEN Project – Contact