

# Cable testing moves into the reliability era

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As offshore wind projects move to higher voltages and longer cable routes, resonant testing and advanced partial discharge monitoring are becoming central to reducing commissioning risk and supporting long-term cable reliability.

Offshore wind cable systems are being asked to do more than ever before. Larger turbines, longer export routes and higher levels of grid integration are placing new demands on the inter array and transmission cables that connect renewable generation to the wider power system. In this environment, cable testing is no longer simply a final check at the end of installation. It is becoming a core part of project risk management, operational assurance and long-term asset reliability.

The basic challenge remains familiar. As individual wind turbine ratings continue to increase, inter array grid designs have moved from 36 kV towards 66 kV and an operating voltage class of 72.5 kV, helping to reduce current and thermal losses. This has important technical implications. These cables are closer to high voltage practice than conventional medium voltage practice, which changes the expectations around commissioning, diagnostics and documentation.

For primary distribution cables rated above 36 kV, standards and industry practice continue to point towards resonant AC testing as the preferred method. This is why resonant test systems (RTS) remain highly relevant for offshore wind farms, where cable terminations, joints and installation quality are critical to project availability. HIGHVOLT's offshore solution was originally developed around this requirement: a compact system suitable for offshore weather conditions that could be transported, lifted, installed and operated in the demanding conditions of an offshore substation.

## From installation test to reliability tool

The 2025 article focused on the first offshore capable RTS system for 66 kV inter array cables. That remains the basis of the article, but the context has widened. Across renewable energy, subsea interconnectors and high voltage transmission projects,

developers and operators are now looking at cable testing through a broader reliability lens. The question is not only whether a cable can pass a withstand test on the day of commissioning. It is also whether potential weaknesses can be identified early enough to avoid expensive in service failures.

This wider market direction can be seen in recent investment in mobile resonant testing capacity. In 2025, Kinectrics signed a contract with HIGHVOLT for 10 additional mobile resonant test systems, with an option for four more. Both companies linked the investment to the rapid expansion of renewable energy construction and the rising need for reliable high voltage cable commissioning services.<sup>3,4</sup>

For PES Wind readers, the point is clear. Cable testing capacity is becoming a strategic constraint as projects scale. Offshore wind, underground transmission and subsea networks all depend on the ability to test long, highly capacitive cable systems safely, repeatably and in line with relevant standards.

## Why resonant testing matters offshore

A resonant test system works by using the cable capacitance and a resonant reactor to form an oscillating circuit. The source only needs to compensate for the circuit losses, which makes it possible to energise long cable lengths without requiring an impractically large power supply. The output is a sinusoidal test voltage with very low harmonic distortion, which is essential when testing high voltage cable insulation in a representative way.

This is particularly relevant offshore, where logistics can determine whether a test campaign runs smoothly or becomes a source of delay. Every component needs to be suitable for transport, lifting, positioning and operation in restricted space. Weather exposure, limited deck access, parallel work on



the offshore substation and safety boundaries all influence the design of the test system.

HIGHVOLT's WRV O system, developed for testing array cables once laid onsite, operates over a frequency range of 10 Hz to 300 Hz and is designed to comply with IEC 63026. A single system is specified for tests up to 80 kV and 37 A, with multiple systems able to be connected in parallel when higher test power



is required for cables extending to several tens of kilometres.<sup>1</sup>

The design priorities are therefore practical as well as electrical: pure sinusoidal output voltage, low partial discharge background noise, modularity, quick setup, robust DNV certified components and operation without moving parts. For offshore wind, these details matter because they influence mobilisation

time, safety planning and the ability to complete work within narrow weather and vessel windows.<sup>1</sup>

#### The importance of partial discharge insight

Withstand testing answers one important question: can the cable system tolerate the required test voltage for the required duration? Partial discharge measurement adds another

layer by helping engineers understand whether localised defects are present and where they may be located. This is especially valuable for long cable systems where terminations, joints and installation related deviations can become the weak points.

Conventional PD measurement can be limited by signal attenuation over longer cable lengths. Higher frequency signals are damped



as they travel through the cable, which can make it difficult to monitor long routes from one end. The original article explained how HIGHVOLT's TruePD concept addresses this by analysing lower frequency signal components and applying signal processing methods to separate PD activity from noise.

HIGHVOLT now presents HiMON TruePD as a partial discharge monitoring approach for AC and DC cable systems. The company states that the TruePD methodology enables detection and localisation of partial discharge active faults over distances between two sensors of up to 12 km. It also highlights remote evaluation, expert diagnosis and early detection of ageing signs as part of the value proposition.<sup>2</sup>

That marks an important shift in how cable testing can be discussed. The technology is not only about finding a defect during a test campaign. It supports a move towards planned maintenance, condition assessment and better understanding of how the cable system behaves over time. For offshore wind operators, this matters because an unplanned cable outage can quickly become a costly event involving vessel availability, weather delay and lost generation.

#### Lessons from offshore operation

One of the main lessons from the development of the offshore RTS was that the test source itself is only part of the overall solution. The operational process is just as important. Offshore testing involves

mobilisation onshore, transfer to marine transport, lifting onto the offshore substation, installation of the test circuit, operation alongside other activities and demobilisation after the campaign.

That is why the offshore system was designed around modularity and practical handling. The original system limited the maximum weight per unit to 3.7 t, helping to simplify open water transport and offshore lifting. Its modular arrangement allowed setup with a small qualified workforce, while touch proof design and offshore capable cable connections supported safe operation in a constrained work area.

These features are not cosmetic. They help reduce the interface risks that often affect offshore campaigns. A test system that is easier to move, connect, verify, clean and remobilise can make the difference between a controlled commissioning activity and a programme bottleneck.

#### A more mature role for cable testing

As offshore wind projects become larger and more grid critical, cable testing is likely to become more integrated with lifecycle asset management. The same system thinking that has shaped turbine monitoring and substation digitalisation is now moving into cable systems. Developers want reliable commissioning evidence. Owners want early warning of faults. Operators want maintenance planning that is based on condition rather than assumption.

For HIGHVOLT, the updated story is therefore broader than a single offshore product. It brings together resonant AC testing, offshore handling experience, low noise PD measurement and advanced monitoring. Together, these developments point to a clear message for the market: cable testing is not an isolated technical service, but a reliability tool for the energy transition.

The growing deployment of offshore wind, subsea links and high voltage transmission will continue to increase the importance of robust commissioning and monitoring. In this setting, resonant test systems and advanced PD methodologies such as TruePD can help operators identify installation issues, reduce uncertainty and protect the long-term performance of critical cable assets.

🌐 [highvolt.com](https://www.highvolt.com)

#### References

<sup>1</sup> HIGHVOLT Prüftechnik Dresden GmbH, WRV O, AC test system with variable frequency for testing array cables.

<sup>2</sup> HIGHVOLT Prüftechnik Dresden GmbH, HiMON TruePD, partial discharge monitoring.

<sup>3</sup> HIGHVOLT Prüftechnik Dresden GmbH, HIGHVOLT supplies mobile resonant test systems to Kinectrics to expand high voltage cable testing capabilities.

<sup>4</sup> Kinectrics, KINECTRICS Signs Contract with HIGHVOLT to Significantly Expand its High Voltage Cable Testing Capacity, 5 June 2025.