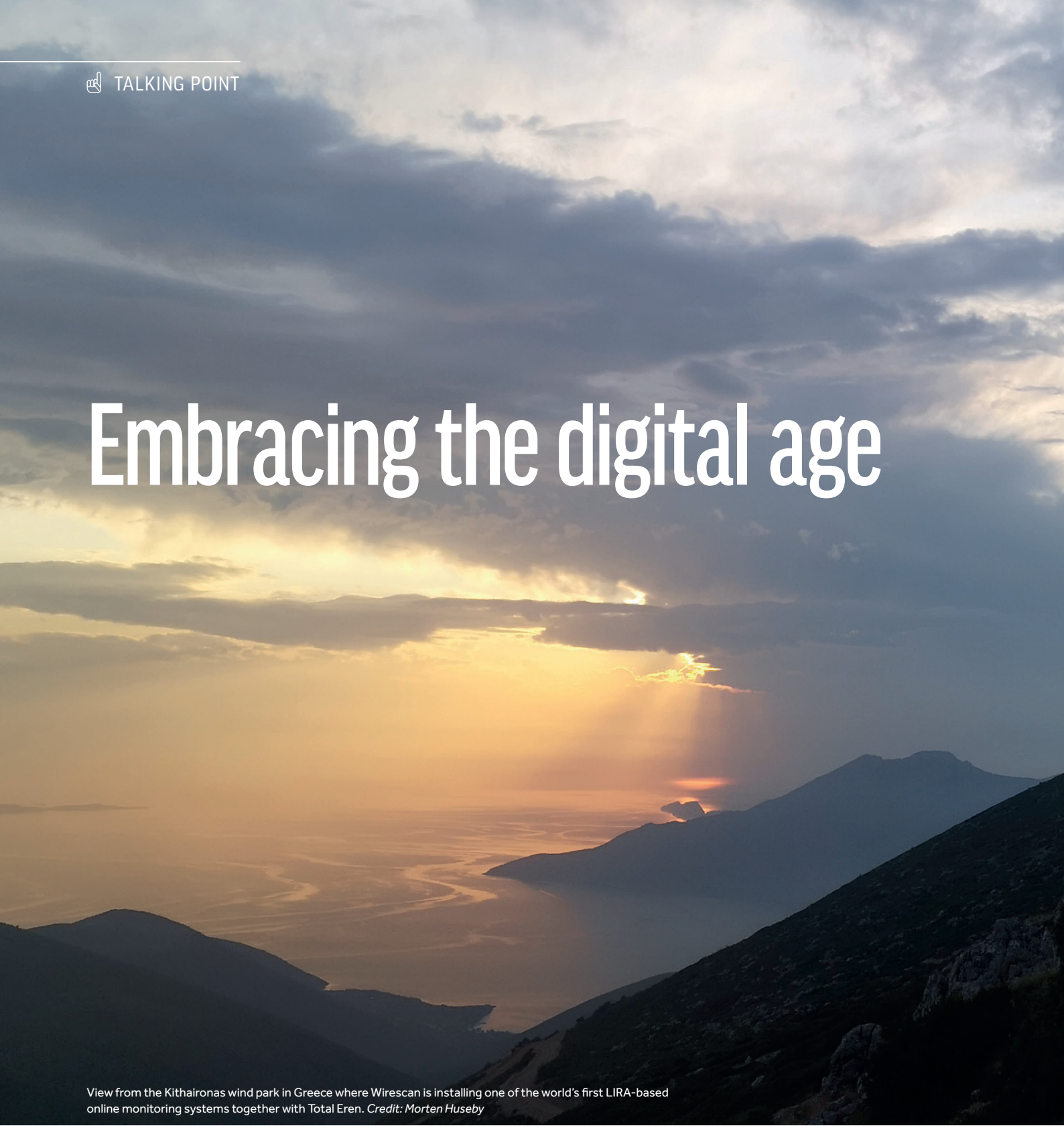
Embracing the digital age



View from the Kithaironas wind park in Greece where Wirescan is installing one of the world's first LIRA-based online monitoring systems together with Total Eren. *Credit: Morten Huseby*

Wirescan has offered the innovative and non-destructive LIRA cable testing technology to the market for some years now. We have been watching the industry and looking at innovation, new technologies and how the cable testing industry can make the transition to the digital age. We came up with Wirescan Digital, a cloud-based cable test database where you can upload and store all your cable test data. This solves many issues related to access and utilization of the data.

In this article we will present some thoughts on the industry, and how our new product, the cable tester Wirescan GO!, together with our cloud service, Wirescan Digital, can improve cable operations and maintenance by digitalizing the condition assessment services. The article presents a timeline of cable testing where we will look at common practices and how digitalization is the future for cable condition assessment and monitoring.

The Past

Cable manufacturers, handlers, owners and operators have been collecting cable condition data from various sources in almost every cable installation project. Cable manufacturers perform regular quality assurance tests throughout the whole production process, and they ensure the quality of the final product with the Factory Acceptance Test (FAT).

Cable handlers and installers now take over the responsibility to bring the cable safely to the site and then install the cable without any quality deterioration. Several test methods are applied during production, before, during and after spooling and installation. After installation and termination, the commissioning tests are performed to ensure cable quality and system integrity before energizing the system. The test methods applied during these different stages are often determined by the customer guided by the IEEE 400 bundle for quality assurance.

Looking at the large number of offshore wind cables already installed and all the cable installation that lies ahead of us, a significant

Wirescan's hardware for data acquisition, the LIRA Acquire.

amount of important cable condition data has been and will be generated. According to operators we have been talking to we can derive three main challenges with this data; the data is difficult to access, the data is in a format which makes it difficult to utilize, or the worst case, the data is not available at all.

As an example; you're running an offshore wind park development project with 100 inter array cables. LIRA, TDR and OTDR are chosen as test and fingerprinting methods, and these technologies alone will generate more than 400 pdf reports if the testing is performed at FAT, spooling and commissioning. These reports are often communicated by email or temporary data rooms and you usually end up printing them on paper and the leaving them in a folder, in a storage room. Not a very efficient and viable solution if you want to extract maximum value from these test reports as they are a part of your total CAPEX of the project and you wonder how can this be taken care of in a simpler and more effective manner?

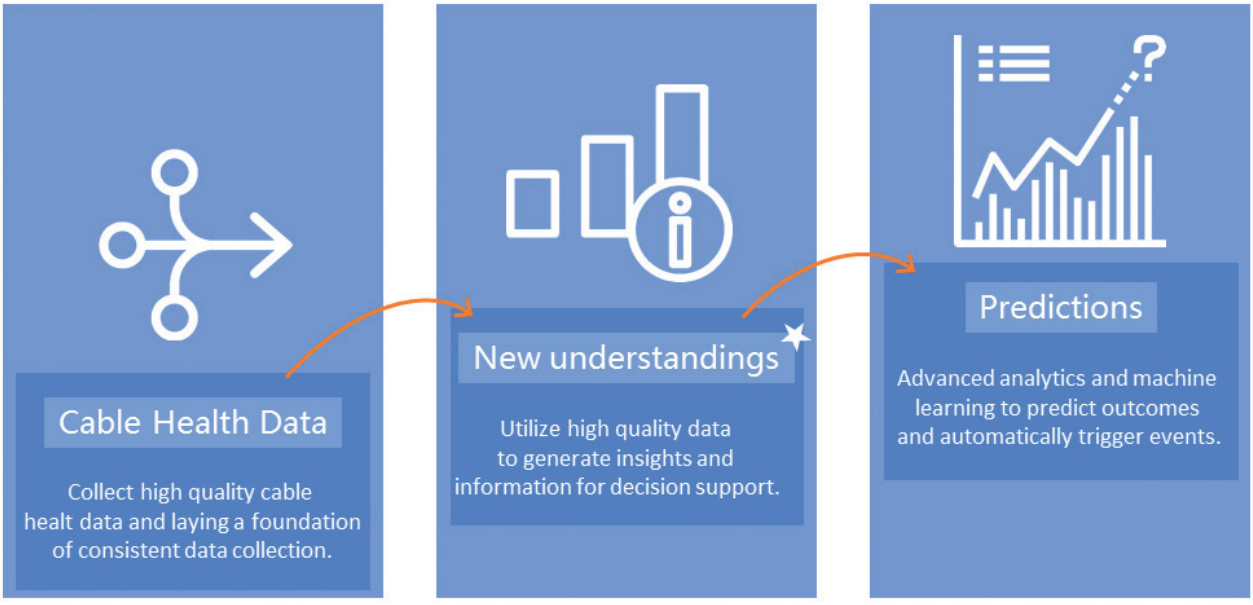
The present

The challenges described above are our motivation to develop Wirescan GO! and Wirescan Digital; we want to help all the cable quality stakeholders to digitize, structure and format their data, so it is easily accessible and can provide a value as a fingerprint and baseline, should something happen to the cable in the future. This can help improve cable operations in several ways: by reducing time spent on condition assessment, maintenance priorities and fault location. This is applied digitalization, meaning that we can utilize and draw benefits from the digitized information.

Wirescan GO! is our new cable testing product. It's based on the same hardware, but we have made a completely new software, which lowers the user threshold significantly when compared to the old system. There is no longer a need for a three-day training course, or a high level of cable knowledge and experience, to be able to collect LIRA data from practically any cable. We have also implemented TDR functionality, together with some basic LIRA results, to provide users with a very useful field tool, which also communicates with our cloud service, Wirescan Digital, for optimal utilization of the collected data.

By collecting, structuring and formatting available test data, Wirescan Digital provides a cloud-based cable database service, where cable stakeholders have on-demand access to all their cable condition data, through a simple web interface on any computer. This also means it's possible to use tablets, and even smart phones, in the daily work of cable engineers, cable maintenance planners and other cable related decision processes. A digitalized cable database enables features, which previously were either not possible, or so complicated and time consuming that the result did not match the effort.

Let's go back to your wind farm in the



Digitalizing the cable testing industry one step at the time. Today, Wirescan Digital has reached the middle column.

wirescan DIGITAL

Harvest

Fast, **simple** and **automated** data acquisition for offline and online cables enabled by **proprietary hardware** and **software** to ensure **data quality**.

Store

Cable database for offline and online cable condition data provides a strong basis for **reference data, data analysis**, and **portfolio comparison .**

Cultivate

Big data analytics, **artificial Intelligence** and **machine learning** enable strong analysis algorithms providing **valuable information** to cable owners and operators.

Reap

Flexibility and **integration**. Wirescan Digital interfaces **information** from critical assests to digital platforms to ensure **operational excellence**.

Wirescan Digital is all about collecting high quality cable test data and turning it into available and useful information.

example above. The farm has now been in operation for 5 years. Everything is looking good, and clean energy is powering thousands of homes. You want to make sure that status quo is maintained and want to assess the condition of your cables. You then perform the same measurements as during commissioning, LIRA, TDR and OTDR. The difference between commissioning and now, is by utilizing Wirescan Digital you upload all the test data and results to the cloud server. Now you know that all your data is secure and available when you need it. One of the strings has caught your attention because it is installed in shallow waters and it is assumed that significant wave and tidal forces are deteriorating the condition of the cables. With Wirescan Digital you can easily compare condition related parameters from the string cables and then further evaluate the cables, which you deem to need more attention. With LIRA results in your database you can evaluate both local and global parameters, in order to assess any splices, joints or even cable ageing against the reference you established during commissioning. Together with the TDR and OTDR data, you have a strong decision support tool available at a couple of clicks.

In fact, you can choose to compare all 300 phases without any additional effort, or you can even compare this wind farm to another wind farm, which has been operating for 8 years and utilize the data to produce a valuable information basis for your maintenance priorities. Wirescan Digital is available today, and we are working closely with customers and digitalization partners to provide the best cable assessment and monitoring tool available.

The future

Wirescan will soon introduce LIRA-based online monitoring to the market. Online in the sense of monitoring cable condition while the cables are energized. Online monitoring of power cables is well-established with technologies, as Online Partial Discharge (OPD) and Distributed Temperature or Acoustic Sensing (DTS/DAS), as the major players. These technologies provide useful information related to the operation of the cable, but they have limitations, or need complex calculations on advanced physical models of the cable, to estimate cable condition parameters. With the ability of using LIRA online, together with Wirescan Digital, we can provide you with a monitoring tool which produces local, or global condition information derived from the physical parameters of the cable.

Wirescan is currently establishing three pilot projects online monitoring with LIRA technology where two of these projects are related to the wind industry. The capability of detecting, identifying and quantifying changes in critical cable parameters brings a whole new set of possibilities in predictive maintenance. It is made available to cable owners and operators.

In addition to this, gathering huge amounts of cable condition data opens possibilities in artificial intelligence and machine learning to produce more advanced, and even completely new, analysis algorithms and prediction models, which will make Wirescan Digital a solid business intelligence companion.

Next steps

First, we're launching the Wirescan GO! and Wirescan Digital late November this year. Customers can already now start their cable digitalization journey, together with Wirescan and our partners and to further develop the system based on customer interaction and feedback. These customers, or early adopters, will be given exclusive rights and pricing as a token of our gratefulness for their trust.

Second, we're working on the implementation of three commercial pilots for the online cable condition monitoring part of Wirescan Digital. These projects will be running through 2020. Our sensor systems will collect and feed data to Wirescan Digital continuously, so we can establish robust analysis methods, customer feedback and establish the basis for predictive analysis.

Wirescan Digital welcomes all cable related industries and cable types!

Wirescan Digital, the future of cable condition monitoring.

Visit us at www.wirescan.no for more insights and contact information.