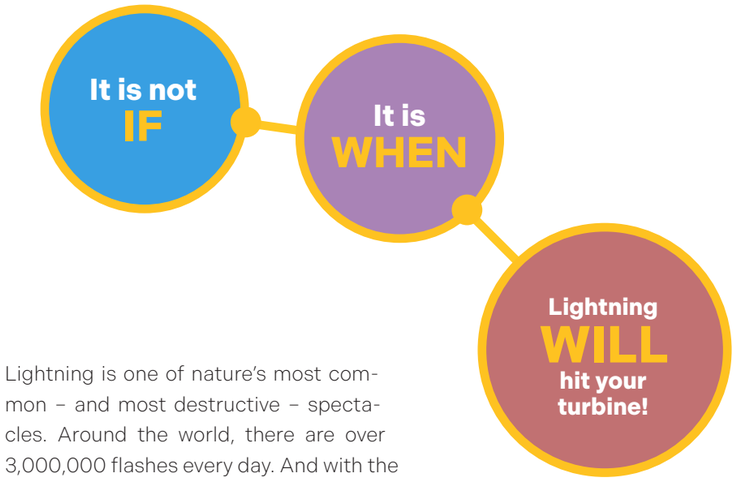
Polytech
Wind for life™

Lightning Protection Systems

From concept to serial production and monitoring

From concept to serial production and monitoring
— all you need to protect your turbines against lightning



Lightning is one of nature's most common – and most destructive – spectacles. Around the world, there are over 3,000,000 flashes every day. And with the climate changing, we are seeing even more lightning events in areas that have never experienced lightning strikes before.

Tall structures such as wind turbines are not only prone to being struck by lightning, but research and field experience also document that they initiate lightning flashes themselves (upward lightning). And with the ideal wind turbine sites gone, developers and owners are forced to erect turbines at (even more remote) locations with suboptimal wind classes, microclimates, and terrains.

When one combines the general lightning phenomena with new lightning patterns due to climate change, increasing turbine size, turbine-triggered upward lightning, and suboptimal (and remote) terrains, it becomes clear: avoiding lightning is not an option. But preparedness is.

So, let's come together and protect your turbines from lightning. They will still be struck. But we can control the event and limit the damages to avoid expensive repairs and downtime.

Think and protect on a system level – from the start

Lightning is no longer an optional parameter to consider when designing wind turbine blades. Lightning has to drive the blade design.

A lightning protection system (LPS) must be an integrated part of any new blades to avoid damages and additional (unnecessary) costs. This also means that every single component of the LPS, from the smallest bolt to the longest down conductor, need to work perfectly together to ensure full protection.

A single component will never protect your turbines. Only a system will.

So, it is time to think system level. And we are here to guide you all the way through.

Start with IEC 61400-24:2019 Ed2.1 standard – but don't stop there

The IEC 61400-24:2019 Ed2.1 standard forms the basis for designing and verifying all LPS worldwide. While the standards must always be the starting point, research and field data have shown that complying with the standards alone might not fully protect your turbines at certain sites.

Lightning strikes vary from site to site and even across a single wind farm due to local topography and weather conditions. There can be huge differences in expected lightning exposure, severity, and occurrence.

Carrying out a site risk assessment prior to design can support your LPS design in the early phases to ensure compliance and full protection – and if needed, even above the standards.

The standards also outline that the LPS must have a minimum performance of 98%. Field data from thousands of turbines worldwide prove that our LPS has a documented performance of 99.9%. So no matter where the turbines are and what blades are installed, we minimize your and your customers' risks for potential lightning failure – and as such, minimize risks for potential repair costs and insurance claims.

Standardize and industrialize your approach

Designing, prototyping, engineering, testing, certifying, supplying. Every stage of an LPS development takes a lot of manpower, expertise, and time, and can drive your overall costs to a level that can challenge your business case.

You need to reduce your costs. And you need to be able to scale blade production to a rate that allows fast(er) wind park development and revenue turnover.

We at Polytech believe in standardization and industrialization. We build blade-specific LPSs (i.e., optimized to your specific blade design) using our pre-tested and pre-certified, off-the-shelf components. This approach reduces your costs and allows you to get your blades with integrated LPS out on the market much faster. It also makes it easier for you to scale up production.

Use a strategic partner

When using a strategic partner for developing an LPS, you get a holistic solution that will minimize your overall risks and resources.

We at Polytech are here to help you and your teams succeed. A success that includes a robust LPS, quick time to market, global supply, and reduced LPS maintenance costs for you and your customers.

Using Polytech as your full-service provider, you get a true partnership that ensures your needs and requirements are met without any indirect and hidden costs. We work closely with your in-house teams to ensure a full overview and a close feedback loop for a smoother and faster LPS development and certification process.

Benefit from Polytech's lightning protection toolbox

Our in-house lightning protection toolbox is based on Polytech's intellectual property, and it includes everything that goes into the development and operation of your LPS and monitoring solutions.

Material expertise to provide you the right material with the optimal combination of physical properties, while considering durability, environmental and operational conditions, and total cost of ownership.

World-leading **lightning expertise** and access to worldwide lightning data for a thorough understanding of lightning behavior on the whole turbine structure and wind park.

Accredited testing centers, including the world's biggest lightning test center with artificial lightning to test everything from full-scale blades and nacelles to larger sub-systems under high voltage and high current. At our material test center, we carry out mechanical tests, so that your system withstands the loads experienced during transportation, installation, and operation. Whereas the environmental tests ensure that once installed, the system withstands all weather conditions at your site.

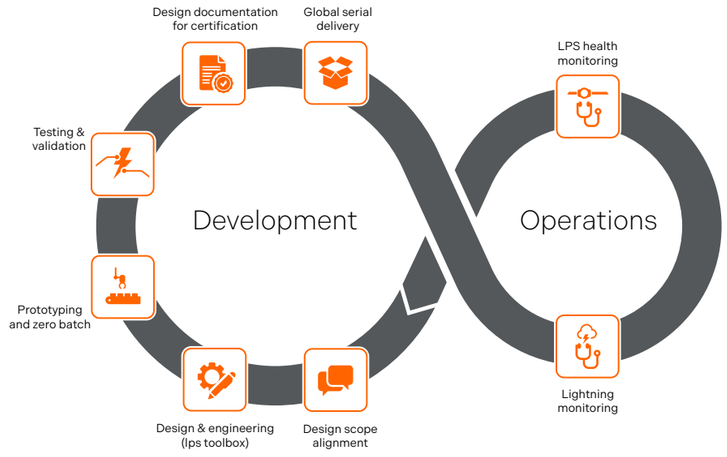
Physical products that are pre-tested and pre-certified and are manufactured in-house globally. Everything that makes up your whole LPS from down conductors, mesh, and receptors to interface protection and current transfer systems.

Digital products, both hardware and software, to measure the key characteristics of the lightning strikes and to monitor the condition of your LPS on site.

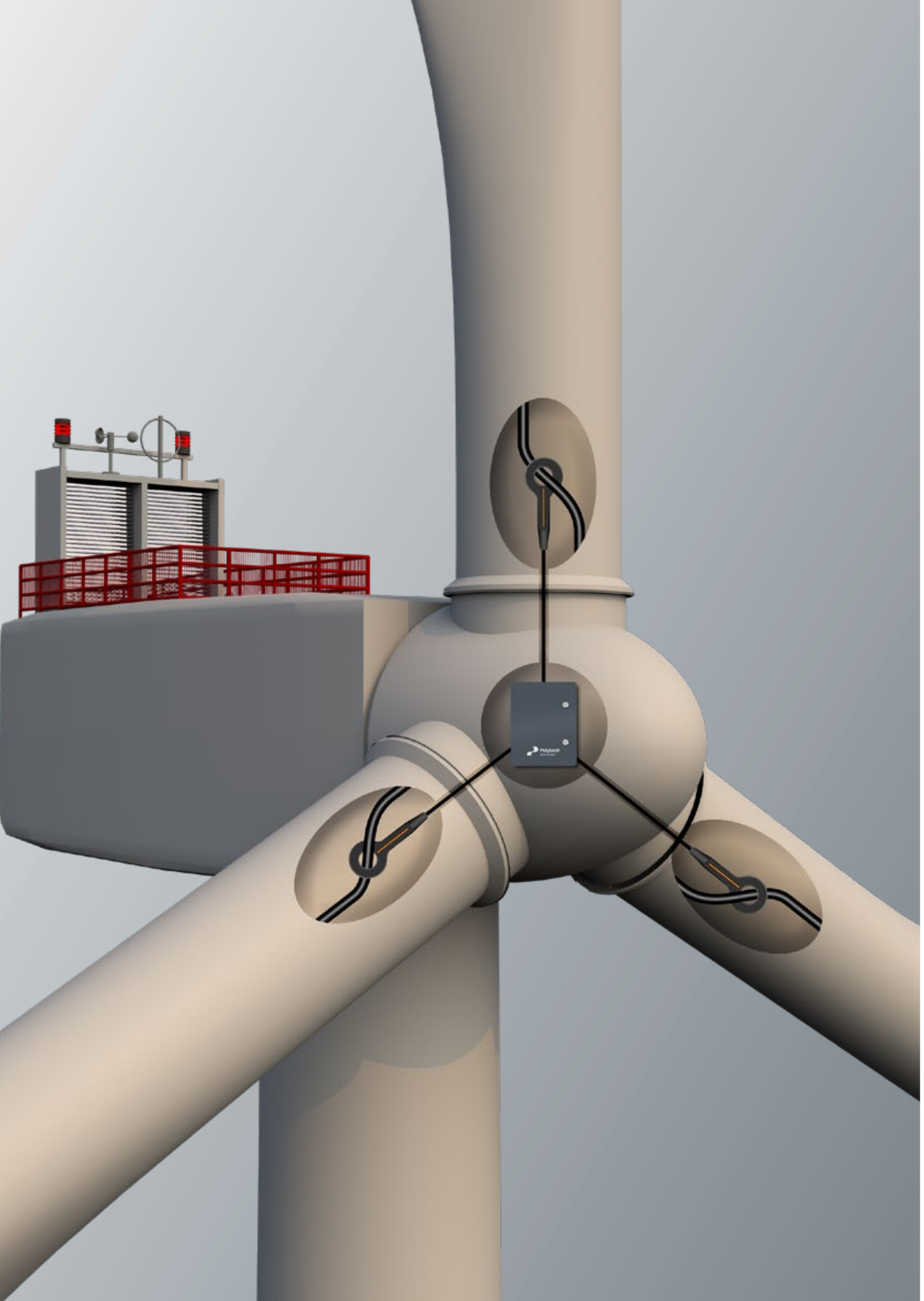
Using these tools, we develop and offer LPS and monitoring solutions for all types of blades and components, installed either during manufacturing or on site (aftermarket).

LPS for carbon fiber, glass fiber, or split blades. Integrated LPS and anti-icing system. LPS for nacelles.

No matter what you need, our team will create a durable and high-performing lightning protection solution optimized to your specific blade design and turbine site.



Partner up with Polytech to get access to some or all aspects of professional lightning protection - from conceptual design to health monitoring.



Global delivery and supply

With our lean production and logistic facilities spread around the world, we can deliver your LPS and monitoring solution globally. This global setup minimizes your supply chain risks, customs duties, and landed costs. Not to mention your carbon footprint, because we optimize the delivery to minimize CO2 emissions.

Once your LPS is operating, we continue to provide you support to ensure that the system is performing as expected. With this close collaboration and feedback loop when implementing zero-series LPS, we can highlight and fix any issues prior to scaling up production and installation. So you can be sure that your system will withstand whatever lightning comes next.

Lightning and LPS Monitoring Solutios

Lightning protection does not stop with the installation of an LPS – and field experience clearly shows this.

Lightning damages are responsible for the largest downtime and repair costs in the wind industry. And the probability of blade damage due to LPS failure is so high that it represents the highest uncertainty in turbine operations and maintenance costs .

Monitoring lightning and the condition of the LPS in the field is your key to minimize your and your customers costs and risks.

Why monitor lightning?

Lightning monitoring became mandatory as part of the IEC 61400-24:2019 Ed2 standard. Complying with these standards and the local regulations is one of the reasons why monitoring is needed. But lightning monitoring is also a key in lowering your maintenance and operational costs.

When lightning strikes, the first question is: can you keep running your turbines safely or should you stop them for inspection and repair?

With lightning monitoring, you can drive your operations based on measured data, evaluate every strike, and only stop the turbine if damages occur. This way, you avoid unnecessary downtime.

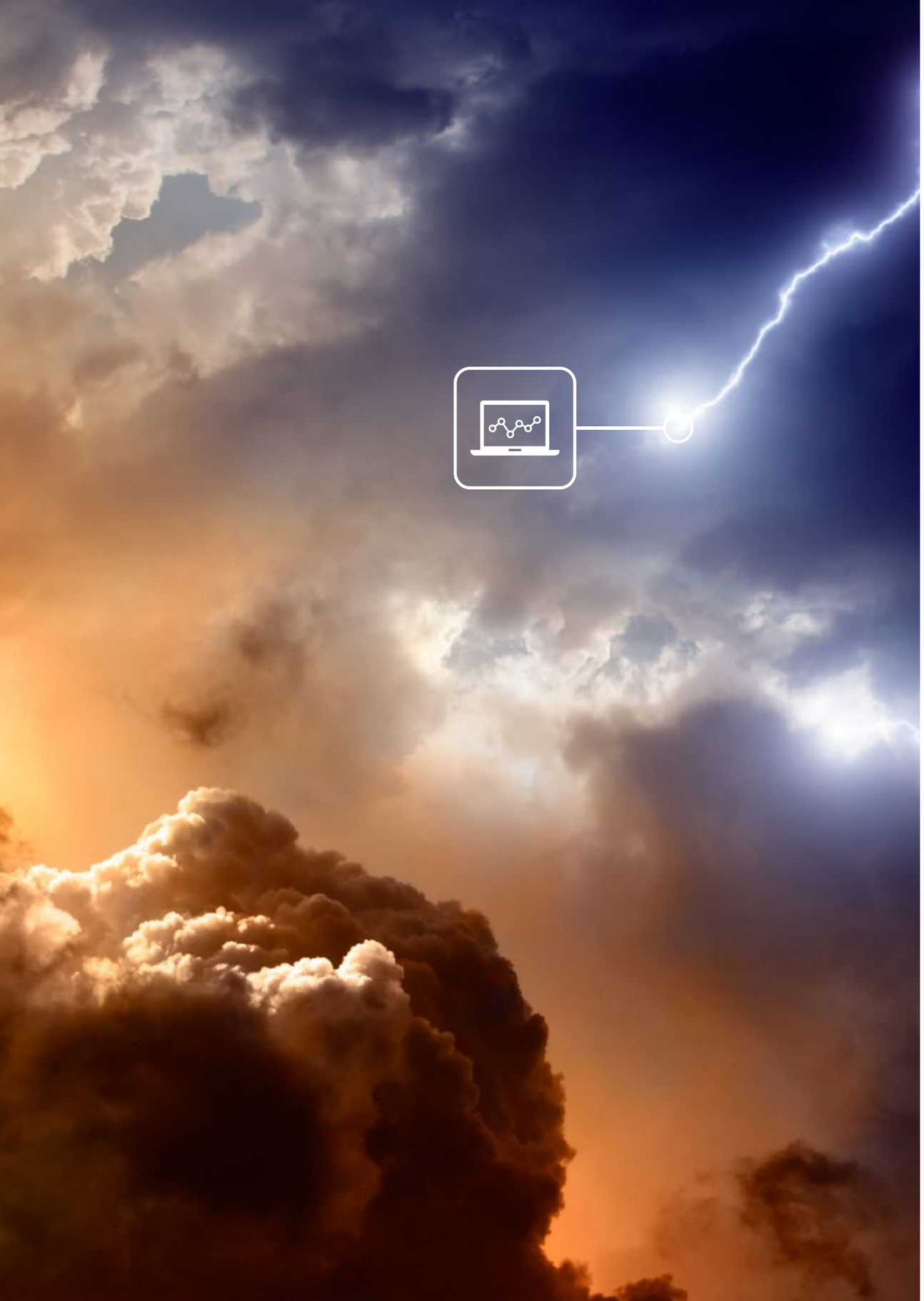
Monitoring also allows you to detect emerging and incipient vulnerabilities and damages on the blade or on the electronics, which may have fatal consequences for the turbine if not taken care of in time. You can therefore optimize your maintenance plan based on data and replace parts when needed.

Having an insight into the lightning environment on site and the turbine's exposure to lightning also opens up other possibilities. You can correlate field exposure with the LPS's field performance and optimize future turbine and LPS designs.

Gather and monitor real-time data with our Lightning Monitoring System

Our lightning monitoring system measures all crucial lightning characteristics in real time and shows the lightning exposure per blade. The system gives you full insights to make an informed decision on your turbines' operation and maintenance plan. More than 15 different types of turbines are gathering essential lightning data with our system from 1200+ turbines worldwide.

Designed specifically for wind turbines, the system is certified by DNV according to the IEC61400-24 Ed.2 standard (verification document VER-08118-0, dated the 2021-12-02). This means you can easily document your IEC61400-24 Ed.2 compliance. You can also use the measured data as a proof of documentation in case of insurance claims and contractual agreements. Knowing and proving what happened to your turbines will leave no room for interpretation.



The data you collect through the Polytech Lightning Monitoring System is data that you can truly trust. And trustworthy data makes it also easier for you to decide what you should do when lightning strikes.

Use these insights to maximize your turbines' performance, to support insurance claims, and to plan maintenance and inspections. With these monitoring insights, you are better prepared to keep your turbines fully protected against lightning damages.

Key advantages of the Polytech Lightning Monitoring System

- Most accurate system in the market, ensuring that all lightning strikes are detected in real time
- Measures events per blade, allowing service and maintenance to happen where it is required
- Accredited by DNV, it gives you data to support insurance claims, IEC61400-24 Ed2.1 compliance, and contractual agreements
- Battery-backed system to record lightning during power outages
- Measures up to 4 consecutive events, and stores more than 300 events in the onboard flash drive
- Measures both up- and downwards lightning strikes

Simplest and cheapest way to monitor lightning

You might just need a simple system that complies with the lightning monitoring regulations and gives you the basic lightning data to make operational decisions. In this case, our Lightning Card System is exactly for you.

You get event-based lightning data with a safe and reliable system.

LPS Health Monitoring to decrease operational expenses

When an LPS is installed in the turbine and operational on site, it is difficult to know how effectively it is working. And you do not want to find this out too late with a major lightning damage.

Our LPS health monitoring system uses blade signatures to check your LPS effectiveness and detect any changes over time. By using our LPS health monitoring system, you no longer need continuity measurements and tests. The system allows you decrease operational expenses and do preventative maintenance and repair before experiencing any unexpected failures or fatal damages.

Combine Polytech LPS with LPS Health Monitoring

Benefit from the ease of implementation and combine your LPS with our health monitoring solution from the start. This way, we can include the sensors in the LPS design and embed the sensors in the system in the factory already.

By evaluating the LPS condition and notifications on an ongoing basis, you can carry out proactive maintenance, which will decrease your operational costs and optimize your maintenance strategy.

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Contact

Are you interested to learn more about our Lightning Protection Systems, do not hesitate to contact our Sales team at *polytech.com/contact*

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