



RISING RISKS, NEW DISTRIBUTION.

THE ALLOCATION OF RISKS IS INCREASINGLY
SHIFTING TO THE MARKET.

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EXECUTIVE SUMMARY

Risks in the onshore wind industry are increasing – and the market is responding primarily with contractual redistribution rather than systematic risk reduction. This results in locally rational decisions creating a systemically inefficient market: lack of transparency increases, responsibility circulates, and the problem intensifies with each new project.

The solution lies in cross-stakeholder transparency and measurable risk reduction. Independent, AI-based predictive maintenance can identify risks early on and reduce them in a targeted manner; in conjunction with AI insurance, this creates an approach for more efficient risk transfer and the establishment of a risk infrastructure.

This white paper creates a common understanding of the problem for operators, insurers, banks, and manufacturers and outlines initial approaches to solving the problem.

INTRODUCTION

The first Wind Finance Summit took place in Berlin on November 27 and 28, 2025. Banks, insurance companies, brokers, operators, and technical experts discussed the increasing risks in the wind industry and collaborated in a workshop on the second day. An important finding was the need for a comprehensive understanding of the increasing risks in the wind industry.

This white paper highlights the problem of risk allocation in the market, describes how the problem arose up to Chapter 3, and outlines initial solutions from Chapter 4 onwards. Its aim is to establish an initial comprehensive understanding of the problem for operators, insurance companies, banks, and manufacturers.

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A MARKET THAT DOES NOT REDUCE ITS RISKS.



The onshore wind industry in Germany is facing a paradox. Despite technological advances, economies of scale, and professional structures, its economic efficiency is stagnating. While electricity prices are forecast to fall slightly* until 2045 and the LCOE (levelized cost of energy) is expected to decline only slightly from 2025 onwards, operational risks are rising continuously (Source 1; Source 2).

The reason for this is not so much technical risks as structural ones: The industry has so far responded to the risk primarily through contractual risk transfer, rather than through systematic risk reduction across contracts. Paradoxically, this means it is acting against its own economic interests, as each player acts rationally within the framework of its own contracts, resulting in a collision of interests and systemic inefficiencies.

This white paper highlights how the wind industry irrationally distributes risks in its current market structure, thereby using capital inefficiently, and how AI-based risk reduction and transfer can break this cycle.

AS RISKS RISE, EXISTING MARKET STRUCTURES REACH THEIR LIMITS.

The wind industry is a closely linked market consisting of four key players: **Manufacturers, Operators, Insurers, and Banks.**

Each actor operates rationally within the tightly interlinked boundaries of its business model. The products and services of the four market players are interlinked in the financing process, creating a rigidity that currently prevents active risk mitigation during the contract periods.

With systematically rising risks, inefficiency in this interlinked market increases over time. This is precisely the situation that exists in the market:

Risks arise in the wind industry throughout the lifetime of the turbines and grow with the size of the turbine: New wind turbines (WTGs) – up to year 4 – are often particularly susceptible to complex technical challenges in the early operating phase, which can be associated with increasingly cost-intensive downtimes; older turbines – from year 15 onwards – are, on the other hand, increasingly affected by age-related wear and tear.

If we now cumulate the WTG in the more sensitive phases using the annual development of onshore wind energy output in Germany, we arrive at the following initial classification:

IN GERMANY, ALMOST 50% OF INSTALLED WIND TURBINES WILL BE IN MORE SENSITIVE OPERATING PHASES AFTER COMMISSIONING OR IN HIGH-RISK AGING PHASES BY 2025.*

It is obvious that the risk profile in Germany will continue to rise every year. The cohorts commissioned between 2010 and 2017 will enter the more sensitive age phase in the coming years. At the same time, more new wind turbines are being built, which will cause significantly higher business interruption costs.

*Quelle:
<https://www.wind-energie.de/themen/zahlen-und-fakten/deutschland/>,
https://www.windguard.de/veroeffentlichungen.html?f&file=files/cto_layout/img/unternehmen/veroeffentlichungen/2025/Status%20des%20Windenergieausbaus%20an%20Land_Halbjahr%202025.pdf



New wind turbines also require more complex logistics due to their increasing hub height. This increasing complexity is compounded by a shortage of skilled workers, which will become significantly worse over the next 10 years as a result of demographic change.

Operating until failure, as is often the practice today, is therefore likely to lead to longer downtimes in the future, especially since spare parts now come to Europe via more complex supply chains.

To counter these increasing risks in the market, liability limits, exclusion clauses, and portfolio restructuring are emerging. These measures create apparent security for the individual player without reducing the real risk to the market.

In practice, this means:

MANUFACTURER externalize operational risks.

INSURER avoid underwriting certain types of wind turbines, increase premiums, or withdraw from the market.

OPERATORS bear higher deductibles or complete losses.

BANKS are tightening economic efficiency requirements and raising interest rates.

BROKER demand longer detention periods from the insurer on behalf of the operator. Currently, 18-24 months is the market standard.

CORE OF THE PROBLEM

The result is a market where risks are passed on rather than reduced.

Responsibility circulates – current risk management resembles an **Old-Maid**

Game: The player with the highest risk exposure is left holding the Old Maid and faces the threat of being forced out of the market due to unprofitability if the risk continues to rise.

Transparency is lost in this market logic, and costs continue to rise. The rational behavior of individual players thus leads to an irrational market outcome for the entire wind industry.

Today's contract and market structures create a false incentive not to actively address risks: in traditional insurance policies, foreseeable damage is generally excluded. An investment that enables early damage detection before damage occurs reduces insurance coverage at the contractual level and places responsibility on the operator, while full maintenance contracts transfer operational control.

The clauses of the separately concluded contracts (insurance and full maintenance) structurally constrain the operator and significantly limit the business case for investments in risk-reducing measures – to the detriment of precisely those players who actually want to limit their own risk through contract design.

Financing over 15–20 years according to the checklist further reinforces these inefficiencies.

The operator's existing business case is jeopardized by this market behavior and structure. Why is this the case? To answer this question, we need to briefly go into the details.

THE INVESTMENT CASE FOR WIND ENERGY IS LOSING ITS APPEAL.

This market behavior and the ignorance of the growing problem in the coming years will lead to a gradual misallocation of capital as risks increase:

INSURANCE COSTS ARE RISING, MAINTENANCE CONTRACTS AND SERVICE CALLS ARE BECOMING MORE EXPENSIVE, WHILE ACTUAL BREAKDOWNS AND DOWNTIME COSTS ARE INCREASING.

Instead of investing capital in prevention and monitoring, it is tied up in unnecessarily expensive insurance policies, service contracts, and downtime.

The economic impact:

- The Net Present Value of the assets decreases.
- Insurability is declining.
- The weighted average cost of capital (WACC) increases due to higher risk premiums.

This leads to specific challenges in the current market structures in the day-to-day work of operators:

Day-to-day work in practice

- Liquidity shortages at the SPV level are to be expected due to existing contractual structures and behaviors.
- Higher volatility in valuations and cash flows.
- Worst Case: loss of individual projects.



Not due to a lack of technology, but rather due to the institutional inertia of individual players, which reinforces itself, the market continues to intensify this problem with each new project financing.

In practice, it is now normal for a single wind turbine to be visited more than 20 times by the troubleshooting service over a period of 1.5 years. The component then breaks down during the windy season, and a six-month interruption in operation from November to April results in a total of seven-figure damages.

This inefficiency is currently tolerated by the market because this operational risk cannot be assessed, priced, and thus managed in a timely manner due to a lack of transparency for decision-makers.

It is important to understand that, based on current contract structures and the shift in risk, an overarching decision to optimize the “total cost” of the damage is not currently possible, as individual contracts limit the decisions that can be made:

Business interruption is covered by the insurer and not by the service provider. Thanks to liability caps, a long business interruption does not initially place any additional financial burden on the service provider. The operator's business case is at risk, due to a lack of liquidity.

The key, therefore, is to ensure that risk no longer circulates, but is made transparent and reduced in a timely manner.



INDEPENDENT PREDICTIVE MAINTENANCE ENABLES RISK REDUCTION.

New technologies are opening up a way to break this spiral of risk in the market through transparency and expertise. By applying independent predictive maintenance at the operator level, the existing conflict of interest between optimizing the wind turbine and the economic optimization of the full maintenance contract can be resolved and risks for the market can be optimally managed.

PREDICTIVE MAINTENANCE AS A TOOL FOR RISK REDUCTION

An AI-based predictive maintenance platform uses SCADA and other available operating and service data, such as blade CMS, powertrain CMS, and other sensors, to model the normal behavior of relevant components and detect deviations at an early stage. Significant anomalies trigger automatic alerts. Developing damage is detected early on.

The transparency thereby created not only makes the risk contractually transferable, but also measurable, reducible, and controllable—and forms the basis for new contract models, for example in combination with insurance solutions.

AI Insurance combines technical risk reduction through AI-based predictive maintenance with traditional insurance solutions (e.g., HDI Global SE). The key point is that damage detected by the system and thus predictable is insured because risks can be identified earlier and actively reduced before they materialize in the contract chains. Thanks to the precise further development of predictability in line with the state of the art, operators can act in accordance with their contracts under AI Insurance protection before damage occurs.

Practical example: Together with HDI Global SE, over 500 MW were transferred to AI insurance products – combined with basic maintenance, full maintenance without main components, or modern full maintenance contracts with liability caps. This results in efficient risk transfer based on real risk reduction – including lower probability of failure and shorter downtimes thanks to plannable repairs. This increased efficiency is a straightforward business case thanks to reduced OpEx compared to the status quo.

This approach has been tried and tested in practice and is a first step toward overcoming increasing risks in the wind industry. The added value speaks for itself, but there are still barriers to acceptance.

ACCEPTANCE BARRIERS.

Since the market launch of AI Insurance (2023), the approach has met with isolated resistance despite its clear advantages. This resistance is not irrational, but rather a reflection of established business models.

BANKS have so far assessed AI insurance approaches inconsistently

MANUFACTURERS see transparency as a competitive disadvantage and risk reduction as potential competition.

INSURERS have so far assessed the possibilities inconsistently.

OPERATORS/PROJECT DEVELOPERS/INVESTORS rely on established models and cannot yet reliably quantify the long-term effects. Operators who want to take action are forced into the dysfunctional model by established market structures.

Only when risks are made visible and measurably reduced for all stakeholders by an independent body can perceptions—and thus market behavior—change in the long term. The barriers mentioned above underscore the need for open dialogue between stakeholders at a round table.

MOVING FROM NON-TRANSPARENT OPERATIONAL RISKS TO RISK INFRASTRUCTURE.

Today, the risks associated with wind turbines are not transparent for operators, insurers, and banks, and are therefore difficult to manage. Sudden damage leads to long and expensive downtimes.

An independent AI-based predictive maintenance platform such as Turbit makes risks visible across all available data sources and enables them to be reduced early and proactively through targeted measures.

This efficient risk transfer can further develop the market:

INSURERS can provide insurance more efficiently and carry more risk for the industry.

OPERATORS can then run their businesses with more capital efficiency.

BANKS receive stronger business cases for financing; risk reduction can be taken into account.

MANUFACTURERS benefit from more efficient use of resources and personnel, increased profitability, and can rely on the Jevons paradox ([Source](#)) due to significant efficiency gains: Technical progress through AI in O&M leads to increased demand for wind turbines as an investment case.

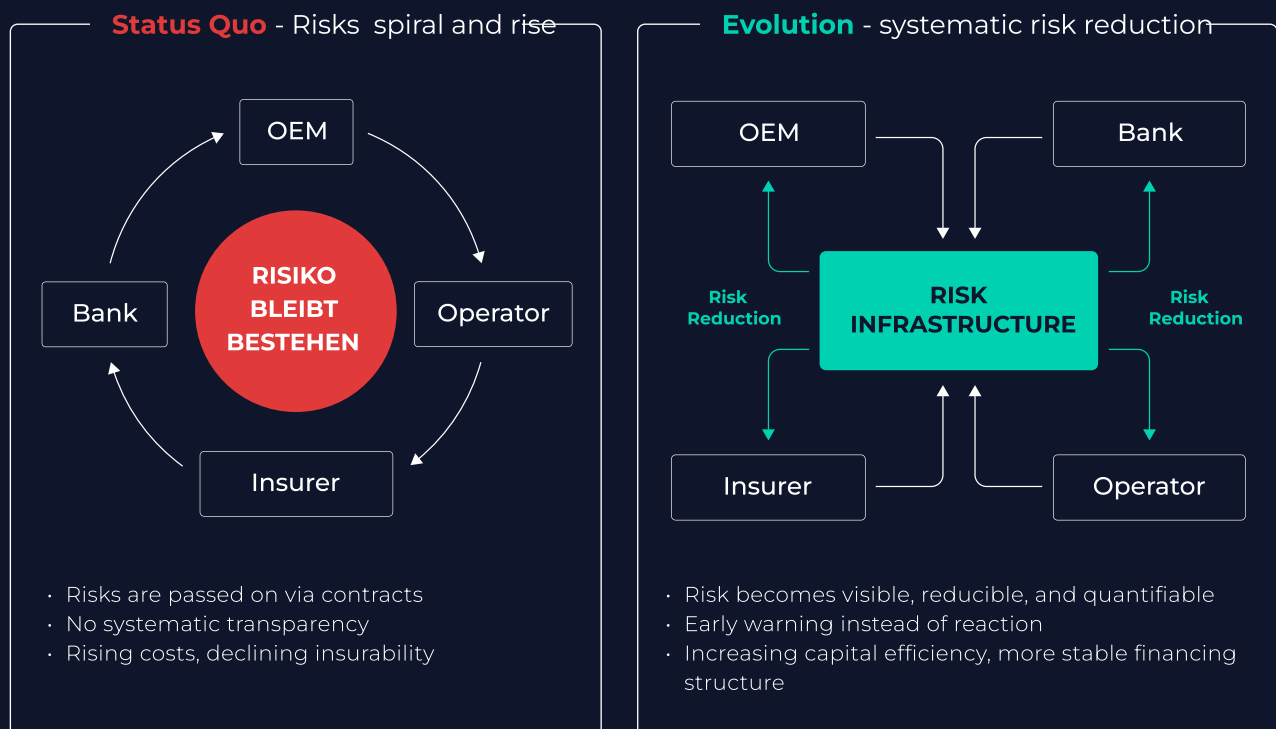
This way, individual interests are transformed into a common interest in efficiency.

TAKEAWAY: RISK INFRASTRUCTURE AS A MARKET ENABLER.

The overarching idea behind AI Insurance is not just a product—it is the path to a risk infrastructure for the market, with an ecosystem developing from the participating players: from sensor suppliers to service providers, experts, and banks to insurance consortiums for large portfolios.

A risk infrastructure absorbs risks from the market and systematically reduces them before they materialize in the respective contracts. This enables cross-actor risk optimization for the first time.

FROM RISK CAROUSEL TO RISK REDUCTION



The legal framework is provided by the EU Data Act. The vision: a wind industry market that manages risks more efficiently and provides greater economic security for the growing number of wind turbines worldwide—so that more wind turbines can be built and operated sustainably.

ASSESSMENT AND OUTLOOK.

Specifically, work needs to be done on three areas: data infrastructure in wind farms, data availability, data quality at sensor level, and uniform documentation of service calls and expert reports, as well as access to know-how at the operational level in technical asset management. This basis is helpful for the further development of the operator business case in cooperation with insurers and banks.

In this closely interlinked market, it makes sense to first establish a common understanding of the problem before implementing solutions. This white paper was written to provide a shared understanding across all stakeholders.

Da die Risiken „nur“ kontinuierlich steigen, entsteht kein unmittelbarer Handlungsdruck – und Entscheidungen werden nicht unmittelbar getroffen. Darüber hinaus erzeugen Special Purpose Vehicles (SPVs) auf Windprojektebene grundsätzlich eine stabile Struktur und begrenzen Risiken für den Betreiber; dennoch steigt das Liquiditätsengpass- und Ausfallrisiko bei Großschäden mit langen Stillständen auf SPV-Ebene systematisch.

Rising risks and Costs are thus putting increasing pressure on profitability and gradually weakening the resilience of the industry. At the same time, falling tender prices – according to current reports from the industry – are leading to further margin pressure. Rising costs coupled with declining revenues are thus resulting in a structural profitability squeeze under the industry's current contract structures.

Turbit wants to solve this risk problem with the market. Due to the complexity and interlocking products and contracts, we see the key in stakeholder-wide cooperation.

In conclusion, when developing solutions, one should always be in love with the problem—never with the supposed solution.

The problem: risks are increasing and being passed on instead of being reduced.

HOW DO YOU MAKE YOUR VOICE COUNT?

At the next Finance Summit, scheduled for October 2026, you can join the roundtable discussion and help solve the problem.

Would you like to support and help shape the next Finance Summit?

FEEL FREE TO CONTACT C.FONTIUS@TURBIT.DE



Christian Fontius

Co-Founder & Chief Risk Officer

c.fontius@turbit.de

+49 177 7178 497

www.turbit.com