

An aerial photograph of a wind farm at sunset. The sun is a bright, glowing orb in the upper right, casting a warm orange and yellow light across the sky and the landscape. Several wind turbines are visible, their long blades reaching towards the sky. The foreground is a patchwork of green and brown fields, with a winding road or path cutting through them. The overall scene is serene and captures the beauty of renewable energy in a natural setting.

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PERFORMANCE ENHANCEMENT IN WIND TURBINE MAIN SHAFTS

CONVERSATION

Vaisala's Romain Guillaume

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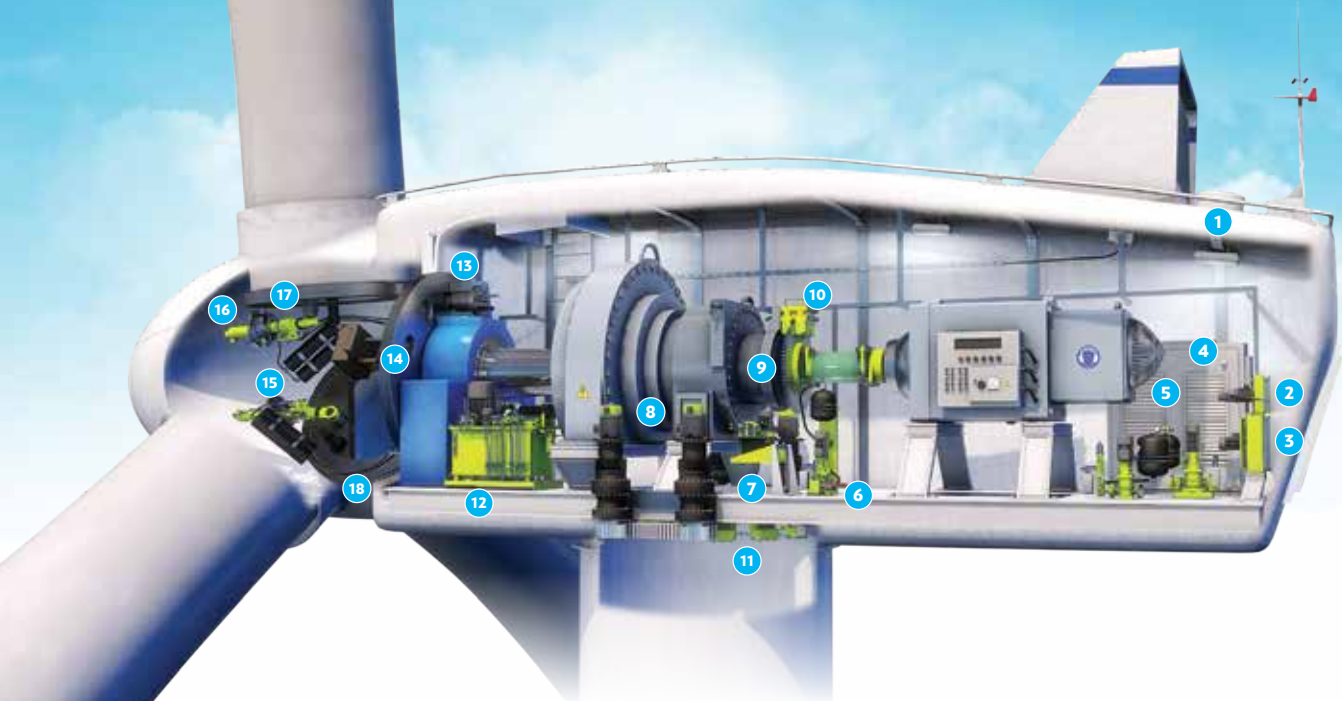
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11

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12

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13

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14

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15

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16

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17

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18

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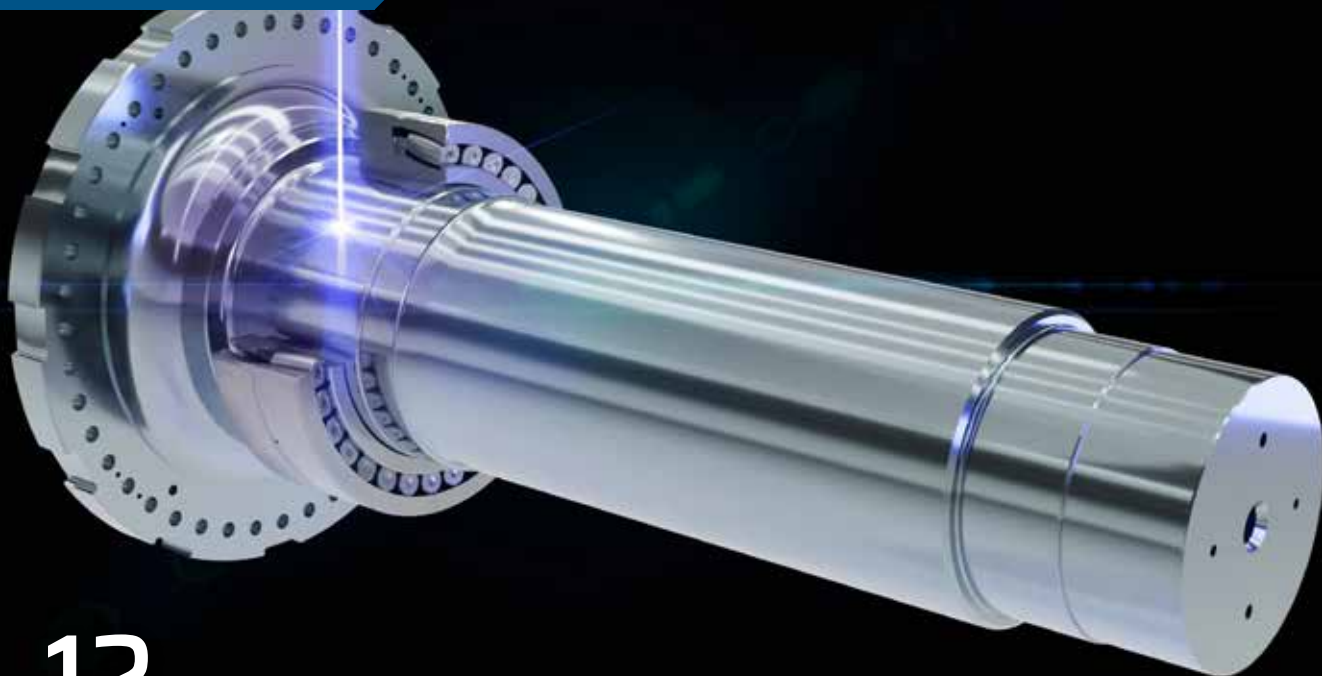
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CONTENTS



12

IN FOCUS

PERFORMANCE ENHANCEMENT IN WIND TURBINE MAIN SHAFTS

Thermal spray and laser cladding coating methods offer strong potential to enhance the performance of main shafts.

THE SILENT GUARDIAN OF WIND ENERGY

Built with precision, shaped by technology, and sustained by innovation, the nacelle cover ensures clean energy reaches homes and industries daily. **18**



CONVERSATION

Romain Guillaume, senior product manager at Vaisala, discusses the company's next generation of Lidar, WindCube 2.1 XP. **22**



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▸ THE FUTURE OF WIND



DIRECTION

8

Governors issue statement in support of offshore wind ▸
Offshore Wind Academy launches international branch ▸
Oceantic earns IACET accreditation



CROSSWINDS

34

ANTI-RENEWABLE POLICIES ARE GOING TO COST CONSUMERS

Stop-work orders for wind undercut investor confidence in financing all energy projects.

TAILWINDS

THE BUSINESS OF WIND



▸ CONSTRUCTION

Odfjell acquires Ørsted shares in Salamander Offshore Wind. **24**

▸ INNOVATION

Aggreko deploys bubble curtain for France wind project. **28**



▸ MAINTENANCE

North Star signs mega ship deal with RWE. **31**

▸ MANUFACTURING

Vestas takes over factory operations near Poland. **33**



Canadian Renewable
Energy Association

Association canadienne
de l'énergie renouvelable

Wind
EUROPE

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FROM THE EDITOR

Exploring gearboxes, repowering, and more

The wind industry may be seeing a bit of a flux due to political grandstanding in the U.S., but that doesn't mean projects and the companies building them are standing still.

With that in mind, the October issue of *Wind Systems* tackles some important topics, many of which will be important to help the U.S. reach that goal, not to mention the rest of the world.

This issue focuses on gearboxes, blades, and repowering — vital subjects that run the gamut from the micro to the macro.

With turbines growing in size and complexity as technology advances, maintenance becomes more of a challenge, particularly when these turbines reach the end of their life expectancy.

In that vein, wind-turbine main shaft failures have become increasingly common. In this issue's cover article, Dr. Rubén Carranza, Ainhua Okariz, and Miguel

Martínez share their insights in the performance enhancement in wind-turbine main shafts using surface coating techniques.

The elements of a harsh environment pose a constant threat to wind-turbine nacelles, so it's important that they are protected throughout their lifetime.

In our second feature, experts from BlueWind discuss the importance of this obvious, but unsung, asset and how nacelle covers stand between steady energy production and costly downtime.

And be sure to check out this month's Conversation feature, where I had the pleasure of talking with Vaisala's Romain Guillaume. In it, he dives deep into the company's newest Lidar, WindCube 2.1 XP, and how this equipment marks a significant evolution in the development of wind Lidar.

You'll find all that and much more in our October issue. I hope you enjoy it.

As always, thanks for reading!



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Giving Wind Direction

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Report: Federal chaos sparks warning signs

From American Clean Power

The American Clean Power Association (ACP) recently released its Clean Power Quarterly Market Report, showing U.S. developers deployed more than 11 GW of new utility-scale solar, wind, and energy storage capacity worth \$15.2 billion in investment in Q2 of 2025. While this brings the total operating capacity of clean power in the U.S. to more than 332 GW, it represents less than a 1 percent increase over Q2 2024 amidst concerning signs for the industry. The clean-power development pipeline showed virtually no growth (expanding by less than 100 MW to 184.5 GW), solar installations declined 23 percent in the first half of 2025, and Power Purchase Agreements (PPAs) plummeted — early indicators of federal policy attacks and fluctuating trade policy undermining American energy security and economic growth.

“America’s clean-energy industry continues to add much needed power to the grid; unfortunately, federal policy obstacles and restrictive mandates are threatening hundreds of billions in planned energy investment,” said ACP CEO Jason Grumet. “The uncertainty created by new bureaucratic delays and unclear demands is having a chilling effect on the pipeline for future energy projects.”

Federal policy actions from nearly every department and an unstable tariff environment have led to a drop in clean power purchasing and planning for the future — despite skyrocketing demand nationwide. The first half of 2025 saw 32 percent less capacity being contracted through PPAs than the first half of 2024. Battery storage PPA announcements were down 88 percent from Q1 to Q2, with wind announcements down 93 percent. Corporate wind and solar PPA prices also surged 6 percent quarter-over-quarter, and 8 percent year-over-year, reflecting the instability of the purchasing environment. Immense industry uncertainty led to stalled growth of procurements during the second quarter of 2025 compared to the previous quarter, as developers and purchasers awaited further clarity on changes to tax credit guidance and attempted to budget with shifting trade agreements.



American Clean Power is the voice of companies from across the clean-power sector that are powering America’s future. For more information, go to www.cleanpower.org



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DIRECTION

THE FUTURE OF WIND



Governors issue statement in support of U.S. offshore wind

A group of U.S. state governors on Labor Day issued a statement supporting offshore wind. The group included Michigan Gov. Kathy Hochul, Massachusetts Gov. Maura Healey, Connecticut Gov. Ned Lamont, Rhode Island Gov. Dan McKee, and New Jersey Gov. Phil Murphy:

“On Labor Day, we honor the strength, skill, and determination of America’s workers. From construction sites and factories to ports and power plants, working people are the backbone of our economy and the foundation of our shared prosperity.

“Nowhere is that clearer than in the offshore wind industry, where labor is on the front lines. Today, more than 5,000 workers — many of them proud union members — are directly engaged with building this new American industry, with many thousands more manufacturing products across 40 states that will help lead to a new era of U.S. energy independence. These projects represent years of planning, billions of dollars in private investment, and the promise of tens of thousands of additional jobs. They are revitalizing our ports, strengthening our supply chains, and ensuring that America — not our competitors — leads in clean-energy manufacturing and innovation,” the statement said.

“We are looking for the Trump Administration to uphold all offshore wind permits already granted and allow these projects to be constructed. Efforts to walk back these commitments jeopardize hardworking families, wasting years of progress and ceding leadership to foreign competitors. Workers, businesses, and communities need certainty, not reversals that would cost tens of thousands of American jobs and critical investment. Sudden reversals would also impact countless other workers and taxpayers on scores of non-energy public projects. The U.S. markets operate on certainty. Canceling projects that have already been fully permitted — includ-

ing some near completion — sends the worrisome message to investors that the work can be stopped on a whim, which could lead them to decide to either not finance different projects or impose higher interest rates that would ultimately place a bigger burden on taxpayers,” the governors said in the statement.



Governors of five states encourage the administration to support offshore wind. (Courtesy: Office of New York Gov. Kathy Hochul)

“At the same time, we remain committed to ensuring that the electric grid is reliable, resilient and affordable. Offshore wind and other renewables are central to that effort, but it must be complemented by a diverse mix of resources — including nuclear power, natural gas, hydropower, and other technologies — that together keep our system strong and our energy sources secure. Doing so will also help us attract major economic development projects that will offer economic security for American workers and transform communities as we move to a 21st century economy. As governors, we are committed to delivering on this energy system for our states and working with the Trump administration to advance projects that meet these objectives,” the statement said.

“On this Labor Day, we reaffirm our unwavering support for working people and the unions that represent them.

We stand with America’s workers and strongly urge the Trump administration to keep these projects on track — for our jobs, our families, our competitiveness, our energy security, and our future,” the statement said.

MORE INFO www.governor.ny.gov

Offshore Wind Academy launches international branch

The American Offshore Wind Academy (AOWA), a Massachusetts-based initiative driven by industry leaders, is expanding globally with the launch of a new, secondary branch: The Offshore Wind Academy (OWA).

The new Offshore Wind Academy will focus on providing comprehensive education, training, and collaboration opportunities in key international markets, including the United Kingdom, Ireland, Germany, Denmark, Netherlands and Norway, as well as in vital emerging markets such as Japan, Australia, and Canada.

The American Offshore Wind Academy was founded to strengthen the offshore wind sector. Our mission is to empower individuals, organizations,



Oceantic has earned accreditation for its education and training programs. (Courtesy: Oceantic)



The American Offshore Wind Academy is expanding to other countries. (Courtesy: Offshore Wind Academy)

and governments to make a lasting impact on the world's clean-energy landscape through a steadfast commitment to innovation and industry growth. The Offshore Wind Academy (OWA) will carry this mission forward on an international scale. While the U.S. market faces headwinds and political uncertainty, the broader offshore wind industry has shown demand for comprehensive education and training.

"When we launched the American Offshore Wind Academy, our focus was on the U.S. market," said Serene Hamsho, AOWA's founder and president. "But we quickly discovered that over half of our learners were joining from Europe and beyond. Expanding

into the Offshore Wind Academy allows us to meet this global demand — offering training across time zones and tailored to local contexts."

"The long-term demand for new sources of energy will transcend our current setbacks," said Jim Bennet, AOWA Advisory Board Member & former chief of The Office of Renewable Energy Programs, BOEM. "Offshore wind is a global effort, and so is the need for a skilled workforce. With the Offshore Wind Academy, we're creating a space where professionals from all regions can learn from each other and build a shared future."

MORE INFO www.offshorewind-academy.com

Oceantic earns IACET accreditation

Oceantic Network has earned accreditation from the International Accreditors for Continuing Education and Training (IACET), a leading not-for-profit organization ensuring accessible, relevant, high-quality education.

Oceantic is committed to delivering standards-based education and training programs for the offshore wind and marine renewable energy industries. As an accredited provider, Oceantic is authorized to offer IACET Continuing Education Units (CEUs) across its suite of training programs, including Offshore Wind 101, Offshore Wind Ready, and Foundation 2 Blade courses.

"IACET accreditation is a significant milestone for Oceantic Network and a powerful endorsement of the quality and rigor of our education and training offerings," said Liz Burdock, CEO of Oceantic Network. "This achievement reflects our dedication to providing industry learners and member companies with trusted, transferable credentials that support professional growth and industry advancement. It's a win

for our members and the offshore wind workforce at large.”

The accreditation, granted at the organizational level, ensures all Oceantic education and training programs meet the highest standards for continuing education. Learners who complete Oceantic courses can now receive CEUs that are recognized by employers, licensing authorities, and certification bodies nationwide. These units are transferable between cooperating organizations, enhancing their value across career transitions and employer changes.

Achieving IACET accreditation was a strategic priority for the organization in 2025. Plans to expand CEU offerings to additional learning events, including the annual International Partnering Forum (IPF), will advance, further strengthening Oceantic’s role as a leader in the education and development of the U.S. offshore wind supply chain.

MORE INFO oceantic.org

Brazil asks to join International Energy Agency

The government of Brazil has made a formal request to become a full member of the International Energy Agency, citing years of close partnership and the value that the IEA provides to its member countries in navigating a complex global energy landscape.

At the IEA’s headquarters in Paris, Ambassador Sarquis J.B. Sarquis presented IEA Executive Director Fatih Birol with a letter from Brazil’s Minister of Foreign Affairs Mauro Vieira and Minister of Mines and Energy Alexandre Silveira, in which they officially requested for Brazil to begin the process of Accession to the IEA.

“Let us convey to you the appreciation of the Brazilian government for the partnership with the International Energy Agency, which has significantly contributed to advancing energy policies in Brazil over the years,” the ministers said. “Recognizing the challenges that lie ahead in the energy

landscape and the strategic support that the IEA provides to its member countries ... (we are) pleased to inform you that our government would like to initiate accession procedures to the IEA as a full member.”

The letter notes that Brazil’s cooperation with the IEA to date has enabled close work on issues such as energy security, energy data and statistics, and energy policy analysis. The letter also highlights that Brazil’s position as “a net oil exporter” with a “diversified energy mix and its increasing leading role in the use of clean and renewable sources will further contribute to IEA’s work and international cooperation in the energy sector.”

“I am very happy to have received the formal request from Ministers Vieira and Silveira for Brazil to become a full IEA Member, a major development for international governance that builds on many years of deepening cooperation across a wide range of energy issues,” Birol said.

“Brazil is a cornerstone of the global energy system today, and its importance is only set to increase in the years ahead.

We look forward to discussing next steps with Brazil and our member governments.”

Brazil is Latin America’s largest country, both in terms of its economy and its population of more than 210 million people.

As a major oil producer and exporter, it plays a key role in support of international energy security. Brazil also has positioned itself as a leader on energy transitions, drawing on its low-emissions power system, abundant renewable energy resources and strong biofuels sector to advance its economic development and social inclusion. Brazil holds the presidency of this year’s COP30 international climate conference and held the G20 presidency in 2024. ✈

MORE INFO www.iea.org



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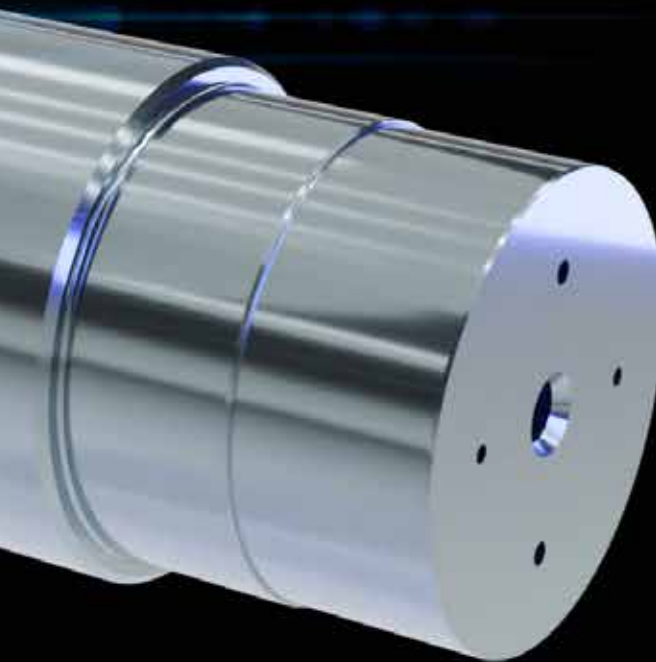


IN FOCUS

RE-POWERING & GEARBOXES

PERFORMANCE ENHANCEMENT IN WIND TURBINE MAIN SHAFTS USING SURFACE COATING TECHNIQUES

Thermal spray and laser cladding significantly improve wear and operational bending fatigue resistance compared to the baseline main shaft material. (Courtesy: Gamesa Gearbox)



Thermal spray and laser cladding coating methods offer strong potential to enhance the performance of main shafts, provided that additive process parameters are rigorously validated and controlled.

By DR. RUBÉN CARRANZA, AINHOA OKARIZ,
and MIGUEL MARTÍNEZ

Failures in wind-turbine main shaft assemblies (MSA) are an increasing concern in the industry, both for their frequency and the downtime they cause [1, 2]. The rising power density of turbines, driven by competitiveness, has led to higher MSA failure rates and the appearance of defect types not seen in smaller units. This trend is prompting a reconsideration of MSA design and calculation methodologies [3, 4].

Conventional repairs that restore MSAs to their original design may not be sufficient to extend service life. Surface coating techniques, increasingly applied in recent years, offer a viable alternative by enabling shaft restoration and avoiding scrapping. Compared with full shaft replacement, these methods can provide cost savings and shorter lead times, while also creating opportunities to improve shaft performance and reduce MSA failure rates.

MAIN SHAFT FAILURES AND REPAIR STRATEGIES

Wind-turbine main shaft failures (MSA) are increasingly common. Causes include inadequate bearing design, manufacturing or assembly issues, insufficient maintenance, shaft cracking [5], or current-induced failures [6]. Low rotational speeds complicate early detection through standard temperature or vibration monitoring [7]. See Figure 1.

Repair strategies often focus on selecting a replacement bearing — ideally with greater capacity than the original — to reduce the failure rate of repaired units [8]. Equally critical is ensuring the integrity of the shaft and housing so that bearings perform correctly.

A recurring issue in MSAs is fretting wear on the bearing seat, caused by the hardness mismatch between bearing and shaft (≈ 60 HRC vs. <35 HRC). Fretting is localized surface wear caused by micromotions under load, directly affecting bearing performance and potentially initiating cracks in the shaft (Figure 2).

Reusing shafts offers cost and lead time advantages in MSA repair. Restoration may involve dimensional recovery via additive processes (coatings), or the use of oversized bear-

ings to compensate for wear-related material loss.

Although several additive techniques are available, their adoption remains debated. These processes are relatively unfamiliar, difficult to evaluate analytically, and sensitive to process control. Among the most widely applied and reliable methods are laser cladding and thermal spray (e.g., EAWS and HVOF).

This study presents laboratory tests comparing the wear

and fatigue behavior of baseline shaft material with shafts recovered using laser cladding or thermal spray coatings.

TRIBOLOGY TESTING

Fretting wear is a primary degradation mechanism in shafts, driven by micromotions during operation and the hardness mismatch between shaft and bearing.

Wear tests followed ASTM G99 and included five groups of test samples (variants):

- ▀ **V#0:** Main shaft base material.
- ▀ **V#1:** HVOF.
- ▀ **V#2:** EAWS.
- ▀ **V#3:** AISI cladding.
- ▀ **V#4:** Inconel cladding.

The counterpart was a 6 mm diameter AISI 440C ball, with certified hardness consistent with bearing surface hardness.

Figure 4 summarizes the test setup and results.

Samples V#1, V#2, and V#3 showed significantly lower wear rates than the baseline (V#0). V#4 did not show meaningful improvement.

HVOF (V#1) delivered the best performance, with significantly the lowest wear rate of all variants.

ROTATING BENDING FATIGUE TESTING

This test compared fatigue performance of baseline shaft material against shafts recovered by laser or thermal spray coatings.

Standard ISO 1143 rotating bending fatigue tests were modified by adding an intermediate bearing support where the coating was applied, to better simulate MSA wind operating real conditions under the bearing shaft surface.

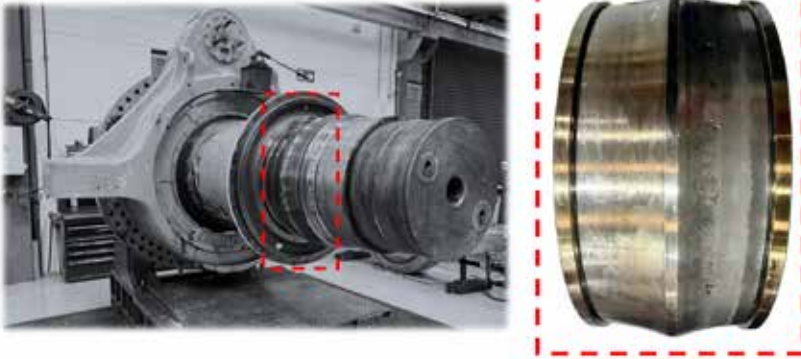


Figure 1: Typical spalling failure [2] in MSA bearing, the most common failure type.

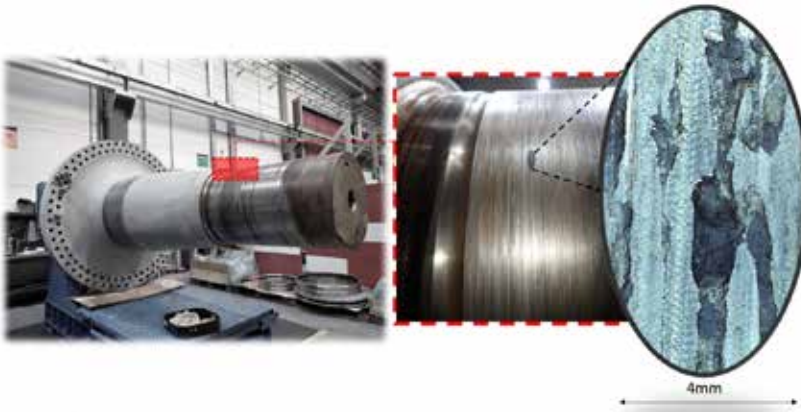


Figure 2: Fretting wear on shaft, under the main bearing inner race surface.

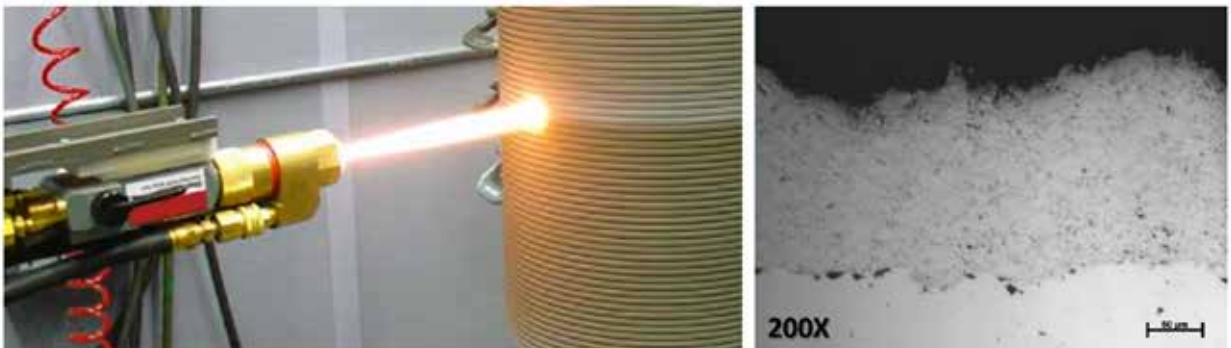


Figure 3: HVOF thermal spray coating process & result metallography.

Figure 5 summarizes the test setup and results.

All coated specimens performed better than the baseline (V#0). Although these results may appear inconsistent with prior studies [9, 10], the difference lies in the modified test boundary conditions, designed to replicate real MSA operational conditions, and not just to evaluate the difference between baseline material and coated mechanical properties. The configuration of this test, including bearing support, allowed evaluation of the fatigue effect of coatings under realistic conditions, where the previously described improvement in wear resistance played a significant role in crack nucleation.

Failure morphology varies by coating type. In uncoated and thermal-spray-coated specimens (V#0, V#1, V#2), fractures originated at the surface. In contrast, in laser-cladded specimens (V#3, V#4), failures initiated below the surface within the heat-affected zone (Figure 6).

For uncoated specimens (V#0) and those with metal spray (V#1, V#2), fractures were located at the bearing interface. The origin was linked to fretting, with localized oxidation and plastic deformation generating oblique micro-cracks from which fatigue cracks propagated. These nucleation points appeared around the full specimen circumference. After nucleation, cracks propagated with smooth textures and beach marks, and the final rupture occurred through brittle overload, visible as a rough and shiny surface.

In laser-cladded specimens (V#3, V#4), fractures originated 2-4 mm beneath the surface, likely in the heat-affected zone. Crack initiation was con-

centrated in a region opposite the brittle overload fracture zone. Fatigue cracks then propagated until final brittle overload failure occurred.

CONCLUSIONS

Laboratory tests confirm that both thermal spray and laser cladding significantly improve wear and operational bend-

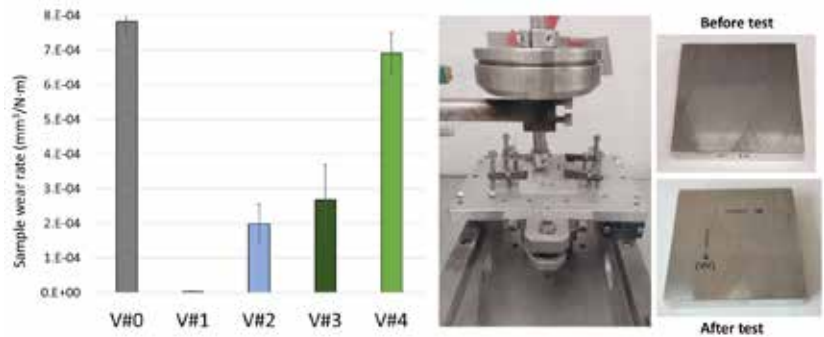


Figure 4: Wear tests according to ASTM-G99:2023.

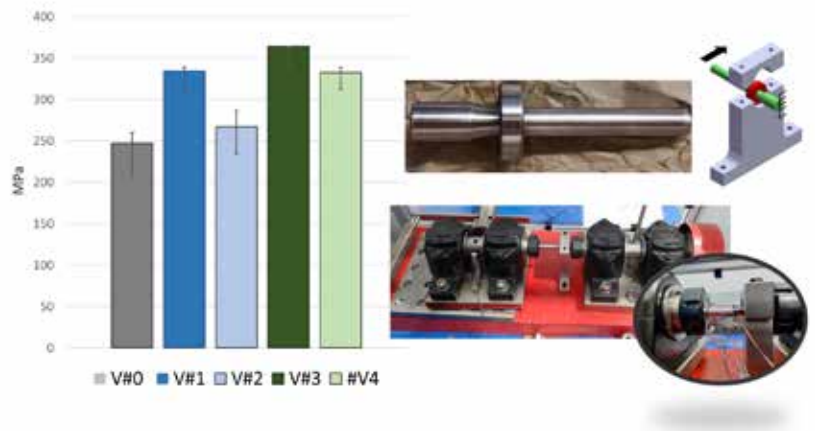


Figure 5: Bending fatigue according to mod. ISO-1143 (50% failure probability).



Figure 6: Failure morphology differences between metal & laser coatings.



ing fatigue resistance compared to the baseline main shaft material.

These coating methods therefore offer strong potential to enhance the performance of (refurbished) main shafts, provided that additive process parameters are rigorously validated and controlled. Special attention must be given to risks such as adhesion failures in sprayed coatings or crack formation in the transition zones of laser cladding. ✂

ABOUT THE AUTHORS

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Efficiency,
repeatability, and
sustainability in
producing nacelle
covers. (Courtesy:
BlueWind)

Built with precision, shaped by technology, and sustained by innovation, the nacelle cover ensures clean energy reaches homes and industries daily.

By CARLOS SINHORI, GUSTAVO RIOS, MATHEUS PORTELA, FERNANDO MELO, and ADEMIR HANSEN

When people think of a wind turbine, their eyes are drawn to the blades slicing the sky or the tower stretching above the horizon. Rarely do they stop to notice the nacelle cover. Yet this seemingly simple shell makes the difference between steady energy production and costly downtime. In wind power, where turbines are expected to operate for 25 years in some of the harshest climates on Earth, the nacelle cover is not decorative. It is the protective skin that shields everything else.

A cover that fails to meet specifications can have consequences far beyond cosmetics. A slight misalignment during production creates assembly problems in the field. A flaw in resin curing compromises structural strength. A surface imperfection invites water ingress and long-term degradation. Reliability begins with the nacelle cover, and reliability is what wind power cannot compromise.

WHY COMPOSITES MATTER

The choice of composites for nacelle covers is not incidental. Fiberglass laminates reinforced with advanced resins provide the unique balance of light weight, durability, and resistance to environmental stress. Unlike steel or aluminum, composites endure temperature shifts, resist corrosion, and maintain dimensional stability. In an industry that measures performance in decades, these attributes are essential.

But composites are only as good as the process that shapes

them. The transformation from a digital drawing to a nacelle cover capable of withstanding 25 years of wind, rain, and ultraviolet radiation requires more than traditional lamination. It demands engineering rigor, materials validation, and quality protocols designed specifically for wind energy. Standards such as APQP4Wind now define how every step — from raw resin to final inspection — must be controlled to minimize risk in the field.

MANUFACTURING PRECISION AT SCALE

The complexity of producing nacelle covers lies not only in size — they can span more than 10 meters — but in the demand for repeatability. An offshore project may require hundreds of identical covers, each with exact tolerances. Any deviation risks disrupting turbine assembly lines or triggering delays in projects where time is as valuable as output.

Modern nacelle manufacturing integrates advanced CNC routers for PET and PVC cores, injection systems for resin and gelcoat, automated handling equipment, and, increasingly, digital traceability systems. Each element reduces variability and shortens production cycles. The objective is to deliver parts that meet specifications every time, with full documentation to prove compliance.

LEAN, DIGITAL, AND TRANSPARENT PRODUCTION

Factories that succeed in this environment combine com-



Think of the nacelle cover as the turbine's skin. (Courtesy: BlueWind)



A nacelle cover protects the gearbox, generator, and electronics inside from wind gusts, lightning strikes, salt spray, and thermal cycles. (Courtesy: BlueWind)

posites know-how with lean manufacturing discipline. Waste is reduced not only in materials but also in movements, setups, and time. The best plants are paperless — production orders, quality checks, and material batches are tracked in real time. If a customer requests the complete record of a nacelle produced years earlier, the information is available instantly. In an industry built on trust, traceability is as essential as tensile strength.

Digitization also aligns with sustainability. By replacing disposable consumables with reusable solutions such as silicone skin technology, manufacturers reduce landfill waste and lower CO₂ emissions. Each improvement compounds the environmental benefit of wind energy, ensuring the technology remains as clean in its production as it is in operation.

THE CASE FOR INNOVATION: SILICONE SKIN MOLDING

One of the most significant recent innovations in nacelle cover manufacturing is adopting silicone skin systems. Traditional vacuum infusion relies heavily on consumables — films, tapes, and release materials discarded after each use. Silicone skins replace those layers with a durable, reusable interface. The result is less waste, improved surface quality, and a cleaner shop floor.

The impact is substantial for large components such as nacelle covers. Reducing 16 pounds of waste per part — as has already been documented in production — translates to several tons of material spared over a turbine fleet. As silicone skin technology evolves, the reduction could reach four times that amount. In a sector measured not only by megawatts but also by sustainability metrics, these numbers matter.

BEYOND THE PART: THE IMPACT ON WIND ENERGY

Once installed, a nacelle cover may look static, but in reality, it is part of a system in constant motion. Every day, it protects the gearbox, generator, and electronics inside from wind gusts, lightning strikes, salt spray, and ther-



The complexity of producing nacelle covers lies not only in size — they can span more than 10 meters — but in the demand for repeatability. (Courtesy: BlueWind)

mal cycles. It also enables clean energy to flow uninterrupted to the grid. Every time a turbine meets its performance targets without interruption, it validates the precision of its protective shell.

For turbine manufacturers and operators, confidence in nacelle production is not optional but a prerequisite. Downtime in a single turbine can cost tens of thousands of dollars. Downtime in a wind farm can alter the economics of entire projects. The discipline embedded in nacelle manufacturing — composites expertise, lean practices, digital traceability, and waste-reducing innovations — contributes directly to the reliability of global renewable energy infrastructure.

LOOKING AHEAD

As the wind industry scales to meet climate goals, nacelle

cover production will face even greater demands: larger components, offshore exposure, and tighter project timelines. The thriving factories will continue to innovate — automating processes, adopting sustainable practices, and training the next generation of composites specialists.

The nacelle cover may remain an overlooked part of the wind turbine's silhouette, but it is the silent guardian of wind energy in practice. Built with precision, shaped by technology, and sustained by innovation, it ensures clean energy reaches homes and industries daily. And in the story of wind power's future, that role is too important to miss. ✌

ABOUT THE AUTHORS

Carlos Sinhori, Gustavo Rios, Matheus Portela, Fernando Melo are with BlueWind. Ademir Hansen is a consultant for BlueWind.



Romain Guillaume

Senior Product Manager ▀ Vaisala

“WindCube 2.1 XP reflects years of customer feedback, rigorous testing, and continuous innovation.”

▀ Why is Lidar important to the wind industry?

Wind Lidar is complementing — and in some areas replacing — the traditional met mast approach for wind resource assessment, but also for the operational phase in wind energy. They are faster to set up, easier to relocate, and they don't need permitting. They're covering higher altitude. With a WindCube 2.1 XP, now we can go up to 400 meters for wind measurement. We measure more height. In term of accuracy, the performance is now well accepted and well known by this industry. That's why I think Lidar is important in wind energy.

In wind energy, we see a growing acceptance for the Lidar remote sensing device. The technology has been around for 20 years. It's well represented inside international standards committees.

The geography in Europe, in the U.S. and in North America in general, and in Asia are very familiar with this kind of device. It's helping the wind industry to be more agile during pre-wind resource assessment, but also the wind resource assessment in the operational phase.

It helps to mitigate and decrease financial risk and, in the end, improve the profitability of the project.

You do it faster; you do it at less cost, and you do it more accurately.

▀ What is your role with Vaisala and your involvement with the development of WindCube 2.1 XP?

I have a mechanical engineering background. I have worked in different manufacturing R&D services for more than 15 years in different kinds of industry — always in energy, but more traditional energy — before joining Vaisala seven years ago. I'm based in France, and I have been the product manager on this wind cube product for two years.

I bring the voice of the customer and the market requirements to the development team. This means that, as we developed 2.1 XP, that we make sure we bring the evolution that the market and the customer was expecting.

▀ What makes WindCube 2.1 XP a significant evolution in the development of wind Lidar?

WindCube 2.1 XP reflects years of customer feedback, rigorous testing, and continuous innovation. Fine-tuning the detector's sensitivity, reducing power consumption, and refining measurement stability across environmental conditions helped us engineer WindCube 2.1 XP to deliver the performance developers need.

Two main points here about the development of WindCube 2.1 XP: One is the extension of the classification up to 200 meters, and the second one is the large improvement we have done on data availability in the most challenging environments with this new 2.1 XP.

We extended our classification. Traditionally the IEC classification was up to 130 to 140 meters due to the limitation of the met mast, for example in Europe or in Germany. With WindCube 2.1 XP, we really attempt to go farther. For developers who will use our Lidar now, they have a third-party classification that is covering from 60 meters to 200 meters, where before we covered 40 to 130 meters. With WindCube 2.1 XP, we are covering the full rotor diameter of a modern turbine.

▀ How does WindCube 2.1 XP deliver the performance developers need?

What is important for developers is to make sure that their project will run smoothly from the beginning to the end to minimize any risk on it. That mean you need high data availability and high accuracy on your remote sensing device.

Now with WindCube 2.1 XP, we have a device that delivers everything without any compromise; you don't need to compromise anything to have data availability. You will have the best data availability in the most challenging environment. This way you can reduce the risk of a delayed project for customers.

Also with improved accuracy, you make sure the wind you are measuring is the true wind of the wind park and

that you don't overestimate or underestimate your future annual energy production.

► **What kind of advancements of the WindCube directly translate into tangible value for the people who are going to be using it?**

As mentioned, it's complementing or replacing met mast in a way. You don't need permitting. You can do it within half a day to deploy this kind of device. You will have a full profile of your wind from 40 meters to 400 meters. You can have ultimately a better, more profitable project that costs less, is more accurate, and gives you a better estimation of what will be the future of your wind farm here and the future production of your wind farm.

► **Let's talk about the Vaisala Compass. What is it and how does it work with the Wind Cube 2.1?**

Our WindCube product previously was delivered with our online platform, and that was called Insight Fleet. Compass is an evolution of that. With it, we bring an improved online platform to access to all the data monitoring of your device but also a new project module or new post-processing algorithm.

It's bringing more value now to the market with its post-processing algorithm and project module to follow your different devices around the world, your different project from the initial site selection to actual operation. You can use Compass to address all your challenges during a renewable energy project.

And Compass is not only for WindCube 2.1 XP, but it can also be used for a solar platform.

► **What gives WindCube 2.1 XP an advantage over other Lidar?**

Vaisala has been investing in developing Lidar technology for over 20 years. From the beginning, our vertical profiler Lidars have been used by research institutions requiring the highest accuracy.

Also, I'd like to mention that, at the company level, we invest 12 percent of our net sales into R&D and have almost one third of our people working in R&D. So, we are continuously developing our technology. Being heavily invested in innovating, we are committed to making the best Lidars for the industry.

From a technical perspective, WindCube 2.1 XP brings to the customer state-of-the-art pulse Lidar technology. This technology has a clear advantage compared to other Lidar technology, such as a constant probe volume, for its simultaneous measurement altitude accuracy. This device is designed to measure high altitude, necessary for the rotor diameter. As turbines are becoming bigger, we need more and more accurate measurements at higher altitude.

Along with WindCube 2.1 XP, Vaisala has a patented wind reconstruction algorithm that we call the Hybrid Reconstruction and a unique selectable reconstruction (FCR) for moderate complex terrain. From an operation perspective,



we have a very wide service network, either with Vaisala or our exclusive service partners all around the world.

This gives the project a unique capability to be maintained directly on site by our field engineer or by service partner. There's no need to send the device back to Europe or any factory to be repaired. It can be directly maintained in the country our customer is in.

Also, our Lidars are not exclusive to wind energy as we provide vertical profiler Lidars and scanning Lidars to other industries where wind measurement accuracy is essential. Such industries would be, for example, the airport industry, meteorology, and air quality.

► **What has been the industry response to WindCube 2.1 XP so far?**

Now that we have launched the product, the initial feedback has been very positive.

Before the launch, we worked with some key customers for more than a year on the beta testing or pre-service phase. And the feedback our key customers gave after testing the device was really positive about the concrete improvements we have brought to this new Lidar. So overall, the reception has been very positive. ✌

MORE INFO www.vaisala.com/en



Odfjell Oceanwind is establishing a presence in Scotland with Salamander Offshore Wind. (Courtesy: Salamander Offshore Wind Farm)

CONSTRUCTION

Odfjell acquires Ørsted shares in Salamander Offshore Wind

Odfjell Oceanwind has completed the acquisition of Ørsted's 80 percent share in the Salamander Offshore Wind Farm.

Odfjell will work with the remaining shareholders of the Salamander Offshore Wind Farm consisting of Simply Blue Group and Subsea7 to continue the development of the project into a demonstration project for commercial-scale floating offshore wind.

Salamander is a 100-MW floating offshore wind project in Scotland, 35 kilometers off Peterhead. The project

was awarded an exclusivity agreement for a seabed lease by Crown Estate Scotland in the INTOG leasing round and recently received section 36 consent from the Scottish government.

"Innovation projects are essential to de-risk relevant floating offshore wind technologies and the supply chain prior to embarking on larger projects like those in ScotWind and many of the INTOG projects that are planned to be operational in the 2030s," said Per Lund, CEO of Odfjell Oceanwind. "OOW has closely monitored the U.K. market for several years and sees the country's commitment to net zero and well-established framework conditions, including annual CfD rounds, as investor-friendly features. The U.K. has become a global leader in offshore wind, and we are very excited that Odfjell

Oceanwind is establishing a presence in Scotland, where our sister companies Odfjell Technology and Odfjell Drilling have been present since the 1980s."

Salamander has adopted Odfjell's Deepsea Star™ semisubmersible steel foundation for the project.

"The Salamander project share acquisition is a key part of our ambition to make floating wind relevant and commercial through the gradual scale-up in project and wind turbine sizes before reaching utility scale," Lund said.

"We are delighted to welcome Odfjell Oceanwind to the Salamander Offshore Wind Farm," said Hugh Kelly, Simply Blue Group CEO and co-founder. "This partnership brings new strength and momentum to one of the country's most significant offshore



Mammoet was selected to marshal foundations for two of the largest offshore wind projects in Europe: Nordseecluster A (Germany) and Thor (Denmark). (Courtesy: Nordseecluster)

wind developments and together, we are supporting Scotland's ambition to become a global leader in offshore wind, delivering long-term benefits for communities, the economy and the environment."

MORE INFO www.odfjelloceanwind.com
www.salamanderfloatingwind.com

CONSTRUCTION

Mammoet manages lifting, moving offshore components

Mammoet is playing a key role in the lifting and movement of next generation wind-turbine components for two offshore wind farm projects.

In 2023, it was selected by Buss Ports to marshal foundations for two of the largest offshore wind projects in Europe — Nordseecluster A (Germany) and Thor (Denmark).

Nordseecluster (A & B) and Thor are joint offshore wind projects of RWE (51 percent) and Norges Bank Investment

Management (49 percent). These offshore wind projects will play a crucial role in their countries' green energy targets. Combined, they will achieve a total planned capacity of up to 2.6 GW.

Mammoet's scope was to manage the phased load-in, temporary storage, and load-out of 116 XL monopile foundations for both wind farms at Buss Terminal Eemshaven in the Netherlands.

With different specifications of monopiles being shipped to the port in different numbers, the load-ins had to be carefully planned so that marshalling equipment was configured in advance and space at the port could be managed effectively.

The monopiles for Nordseecluster A weighed about 1,500 tons and measured on average 85 meters in length; the foundations for Thor stretched approximately 100 meters and weighed about 1,500 tons.

Monopiles are normally transported in a longitudinal configuration. However, to deliver more units per voyage they were loaded in a transverse orientation and protruded slightly over the side of the vessel.

To support this, Mammoet needed



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ENEOS is teaming up with Shoreline Wind to accelerate construction of Japanese offshore wind projects. (Courtesy: ENEOS)

to unload these structures sideways. This methodology also allowed the load-out method from China to be reversed. Due to the low ground bearing capacity of the quay, an unusually long linkspan ramp was used. Typically, linkspans measure five meters — this ramp stretched about 12 meters before touching down on the quay.

It also would have meant there would only be enough time to offload one monopile in the first tidal window. An alternative solution had to be found.

“To overcome this, we placed wooden mats on the deck of the vessel to gain the height we needed,” said Wouter Santen, project manager at Mammoet.

For the final load-outs, the monopiles were driven back to the quayside and lowered into concrete cradles, ready to be lifted onto the delivery vessel using its on-board crane.

By overcoming the tidal constraints and the limited ground-bearing capacity of the quay, it made it possible for up to 10 monopiles to be delivered at a

time instead of eight or nine.

Over the duration of this year-long project, several trips from China were spared as a result. With each voyage taking about 60 days of sailing, the time and cost savings were significant.

MORE INFO www.mammoet.com

CONSTRUCTION

Opoura, Deutsche Windtechnik add turbines to platform

Opoura and Deutsche Windtechnik with an agreement to integrate more than 6,000 turbines from a wide range of manufacturers into their OneView® claVis Monitor energy management platform. The cloud-based software serves as Deutsche Windtechnik’s consolidated control room system and is already overseeing 6,100 onshore turbines, representing about 11 GW

of wind capacity. With the addition of thousands of turbines, Deutsche Windtechnik takes advantage of Opoura’s centralized solution, which is designed to remotely monitor and troubleshoot a highly heterogeneous turbine portfolio in one single overview. The solution addresses a widespread challenge faced by independent service providers (ISPs), technical asset managers, and others overseeing large, mixed fleets of wind turbines. Especially Opoura’s ability to handle multi-tech complexity is highlighted by the customer:

“After years of close collaboration, we knew Opoura could deliver a software platform that meets the technical and operational scale of our fleet,” said Hauke Behrends, managing director at Deutsche Windtechnik GmbH & Co. KG. “As the leading multi-brand service provider, our key benefit of the OneView® claVis Monitor is that we can check various system technologies simultaneously in a single tool. This enables us to achieve significantly better response times for incoming faults.”

According to Lars Wollschlaeger, Opoura sales manager, the project also highlights the importance of data normalization that can create clarity in managing large fleets with diverse technologies:

“We are happy to continue our strong partnership with Deutsche Windtechnik,” he said. “Over the years, we have worked closely with control center operators and understand how important it is to have clear, filtered views that match different roles. I’m proud we can deliver exactly that. As their impressive wind portfolio keeps growing, so does the need for a scalable platform that is ready for the future.”

Thomas Bagger, CEO at Opoura, views the collaboration with an industry leader like Deutsche Windtechnik as a strong endorsement of the company’s expanded capabilities and direction.

“Our ambition is to support the biggest industry players with intelligent solutions and expertise — and in that

way do our part in the energy transition,” he said. “This partnership is a clear example of that commitment. I’m honored that Deutsche Windtechnik continues to place their trust in us. Even with our new name and added teams of experts.”

MORE INFO opoura.com

CONSTRUCTION

ENEOS partners with Shoreline to boost Japan offshore wind

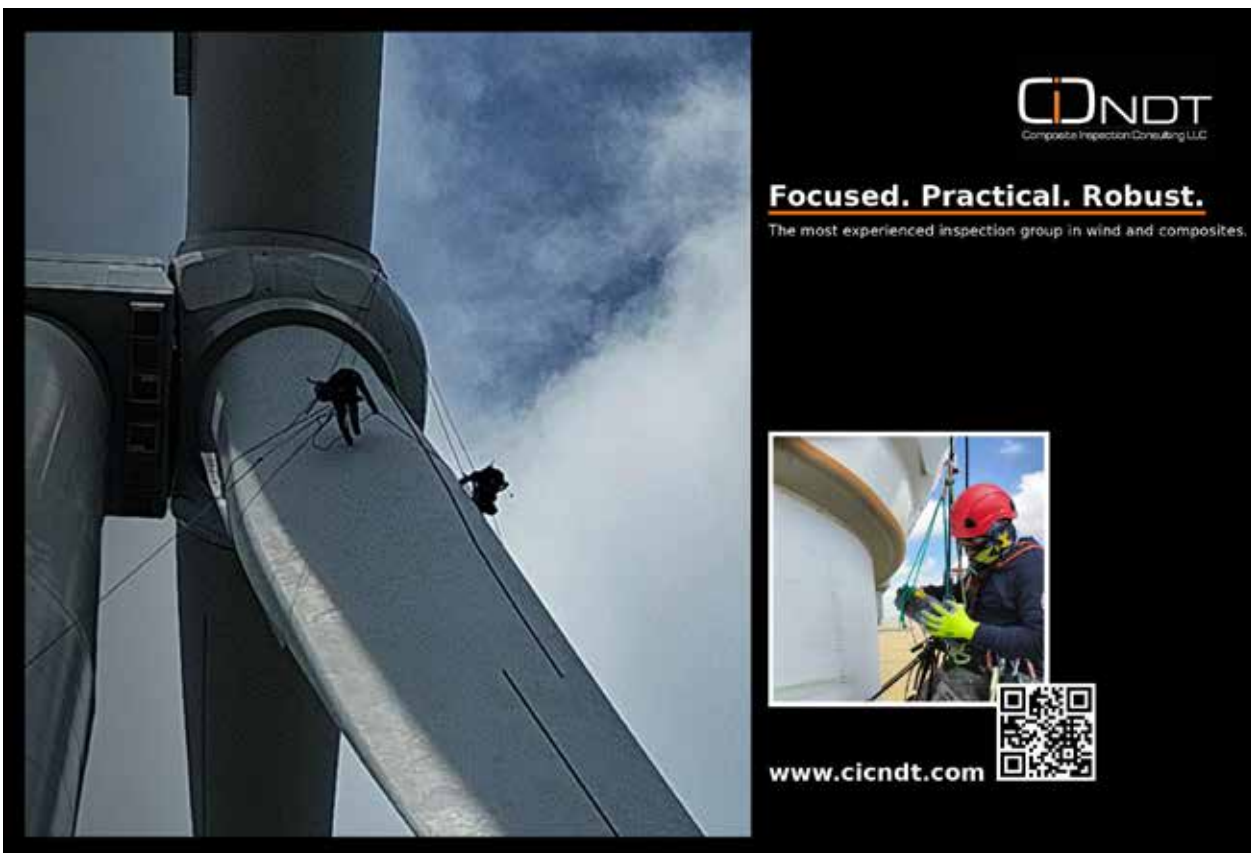
Shoreline Wind, the only dedicated AI-powered platform designed to manage the full lifecycle of wind farms, recently announced a partnership with ENEOS Renewable Energy (ERE), a leading developer in Japan’s wind industry, aimed at boosting the efficiency of its offshore wind projects in Japan.

ERE will deploy Shoreline’s digital platform across its current offshore developments, tackling challenges such as complex logistics, unpredictable weather, and tight supply chains.

From initial project planning and simulation to long-term operations and maintenance, Shoreline’s platform will offer ERE a streamlined approach to project development and management.

The partnership comes at a critical time for Japan’s energy transition. Under its 7th Strategic Energy Plan, Japan has announced plans to develop up to 10 GW of offshore wind projects by 2030, with a longer-term target of 30-45 GW by 2040. Achieving these targets will require more precise project planning and efficient coordination throughout industry and across the APAC region.

“Shoreline’s platform gives us a new level of insight and control to tackle the complexities of offshore development,” said an ERE spokesper-



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Jaeger Maritime Solutions required a bubble curtain to absorb and disperse sound, safeguarding surrounding marine ecosystems from harmful noise levels. (Courtesy: Jaeger Maritime Solutions)

son. “Shoreline’s AI-powered solution will enable us to create more efficient and cost-effective strategies for construction and ongoing operations and maintenance across all of our projects. Shoreline’s technology will also help to accelerate Japan’s ambitious offshore wind targets.”

“We’re excited to partner with ENEOS Renewable Energy as Japan drives forward to scale up its offshore wind sector,” said Ole-Erik Endrerud, founder and chief product officer at Shoreline Wind.

“The Shoreline platform simplifies offshore wind-farm operations, mitigating risk and uncovering hidden efficiencies across the entire supply chain. By implementing our platform, hopefully we can help ERE deliver these benefits for Japan.”

MORE INFO www.eneos-re.com/english/shoreline.no

INNOVATION

Aggreko deploys bubble curtain for France wind project

Energy solutions leader Aggreko has supported Jaeger Maritime Solutions in deploying a bubble curtain for an offshore wind-farm project situated off the coast of France. Before driving the turbine’s piles into the seabed, a bubble curtain was required to absorb and disperse sound, safeguarding surrounding marine ecosystems from harmful noise levels and fine particles produced by underwater construction.

This was when Jaeger Maritime contacted Aggreko to supply a compressed air solution capable of powering the bubble curtain for its vessel. “Throughout the construction of offshore wind farms, protecting marine life is a top

priority. We required a partner with proven project management expertise, who could not only supply 100 percent oil-free air compressors, but also manage the logistics and performance monitoring offshore,” said David Baum, Jaeger Maritime Solutions managing director. “Aggreko delivered a solution that was both technically sound and environmentally conscious, with their team of expert engineers with us every step of the way.”

With both businesses committed to protecting marine life while supporting the transition to a more efficient, sustainable future, Aggreko leveraged its Greener Upgrades™ portfolio to supply a bespoke package of 18 stage V 100% oil-free air compressors, along with a 60 kVA Stage V generator to power the winch, positioned at the stern of the vessel, used to reel on the bubble curtain.

The compressors were connected to hoses that delivered the volume

and pressure needed to form the bubble curtain, minimizing harmful emissions in the process. The Aggreko Remote Monitoring (ARM) service was also provided to enable real-time, off-shore monitoring of the air compressor's performance.

100 percent oil-free air compressors eliminate the need for airborne oil and prevent the risk of contamination during critical construction activities. Aggreko's range of 100 percent oil-free air compressors meet the strict ISO 8573-1 Class 0 certification, ensuring the highest level of air purity required for sensitive applications like bubble curtains. "This project was a great example of environmentally responsible offshore construction, and we remain committed to contributing to the continued development of renewable energy infrastructure in Europe," said Michel Maaskant, renewable energy specialist at Aggreko.

MORE INFO www.aggreko.com

INNOVATION

Robosys leads ORACLES consenting venture

Robosys Automation, a leader in marine autonomy systems, is leading Project ORACLES, a venture that aims to transform the environmental consenting process for offshore wind farms. The Project ORACLES consortium includes ACUAOcean, MSEIS, Plymouth Marine Laboratories, and the Offshore Renewable Energy Catapult.

The data collection process for environmental monitoring at proposed OWF sites is labor-intensive, with separate providers handling various aspects such as bird monitoring and sea conditions. Data is collected manually and analyzed after it reaches shore, significantly slowing down the decision-making process. Aiming to reduce the approval timeline, Project

ORACLES will leverage advanced marine robotics, advanced autonomous systems, and other digital ocean technologies, to streamline, improve, and accelerate the process, and help meet the UK's target of 60GW of offshore wind capacity by 2030.

The project's 14-month research phase will advance the use of clean maritime solutions, including ACUA's Unmanned Survey Vessel (USV), which will be equipped with a range of environmental sensors (eDNA, ADCP, acoustics) to collect comprehensive, real-time data on marine life, water quality, and environmental changes.

The consortium will develop the dynamic positioning system and a BVLOS (beyond visual line of sight) winch profiling system for water column data collection, and the integrate multiple sensors delivering a novel and highly effective output, together with automated ballasting.

Robosys Automation, already a trusted provider of marine autonomy



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Robosys Automation is leading Project ORACLES, a venture that will transform the environmental consenting process for offshore wind farms. (Courtesy: Robosys)

systems and vessel control systems, will additionally deliver a new capability to operate multiple USVs being operated from a single Remote Operations Centre (ROC).

Project ORACLES' proposed outcomes will enable deployment of significant payloads, support USVs operating in higher sea states and across extended operating periods, and reduce capital, environmental and operational costs, whilst delivering and managing data more effectively.

The innovations involved not only reduce the need for multiple crewed survey missions but also decrease CO2 emissions and environmental disturbances compared to traditional crewed vessels, therefore aligning with the U.K.'s clean maritime goals.

In support of the U.K. government's Levelling Up agenda, Project ORACLES

will have a direct impact on the U.K.'s South West's marine innovation cluster, fostering high-skilled jobs, supporting future skills, and contributing to the region's economic growth. In addition, the project's outputs will provide new business opportunities in the rapidly expanding global offshore wind market.

"This ambitious project will revolutionize the environmental consenting process for offshore wind farms (OWFs) in the Celtic Sea and other areas across the U.K.," said Nigel Lee, project lead and Robosys' CSO.

"These technological innovations will reduce the need for crewed survey missions and accelerate data delivery, enabling a faster, more cost-effective consenting process."

MORE INFO robosysautomation.com

INNOVATION

Ruselectric develops commercial duty ATS

Ruselectric, a Siemens business and an industry leader in the design, manufacture, and support of mission-critical automatic transfer switches, has developed a commercial duty ATS.

Automatic transfer switches serve to transfer electrical loads from a preferred power source to an alternate source when the preferred source's voltage and/or frequency varies from preset limits. The switches also retransfer loads when optimal voltage and frequency in the preferred source is restored. Long used in mission-critical, life safety applications like healthcare

facilities to ensure continuous power supply, the switches can also provide an important function in commercial applications during outages.

An ATS is put in place to sense for a loss of normal power from the usual power source, typically utility power supplied through power distribution equipment. The market for commercial automatic transfer switches is growing faster than that of mission-critical systems; and the widespread demand for a low up-front cost alternative to mission-critical equipment has driven lower quality engineering and design in the market.

Russelectric adapted its mission-critical ATS technology to meet the differing needs of these commercial applications. The resulting RTSCD ATS was designed with similar design features to existing mission-critical ATS systems, ensuring consistency across the company's overall product offerings. Rated for applications with current of 400 amps or less, the RTSCD delivers a lower price point than seen in the mission-critical space.

"Throughout the industry, we kept hearing from end users who wanted the same kind of quality of design that they have come to expect in mission-critical technology, but for lower amperages and at a lower price," said Randy Adleman, vice president of commercial operations at Russelectric.

MORE INFO www.siemens.com/us/en/products/energy/russelectric.html

MAINTENANCE

North Star signs mega ship deal with RWE

North Star recently secured multi-million-pound agreements to support RWE's offshore wind-farm portfolio with four hybrid-powered commissioning/service operation vessels.

The deal comprises two long-term charter agreements and two reservation agreements for new-build vessels,



Commercial Duty Transfer Switches ensure safety and continuous emergency power in commercial applications. (Courtesy: Russelectric)



The agreement for North Star is set to secure employment for up to 200 personnel working across the fleet. (Courtesy: North Star)

together representing the biggest in North Star's history. This four-vessel agreement for North Star is set to secure employment for up to 200 personnel working across the fleet, including up to 100 new roles for on- and offshore over the next decade.

The new partnership includes the charter of two next-generation hybrid commissioning SOVs to support RWE's North Sea operations and maintenance schedule.

The Grampian Eagle and the Grampian Kestrel were delivered into operations this year; both vessels are futureproofed and ready for alternative low-emission fuels.

"This landmark deal is the beginning of a strategic partnership between two industry leaders, built on early engagement, mutual trust and shared ambitions," said North Star CEO Gitte Gard Talmo.

"We are proud to secure agreements for four state-of-the-art vessels and grateful for the trust put in us by RWE. Our focus is delivering world class operational performance, utilizing all of North Star's expertise and capabilities in SOV services.

With these agreements, we're putting our scale and track record where it matters the most.

This is all made possible thanks to the unwavering dedication, ambition and drive of our entire team, delivering day in, day out, powering our continued growth."

RWE is one of the world's leading companies in offshore wind. The company operates 19 offshore wind farms (RWE's share amounts to 3.3 GW) and has four offshore wind projects under construction in U.K., Denmark, Germany, and the Netherlands (RWE's share amounts to 3.1 GW).

North Star is headquartered in Aberdeen and has strategically located facilities in Newcastle, Lowestoft, and Hamburg.

Its workforce is made up of about 1,400 offshore and onshore personnel and carries out all its ship maintenance in-house.

MORE INFO www.north-star.co.uk

MAINTENANCE

FairWind names first regional head of service for SESA



Aitor Diaz de Lezana Fernández will lead FairWind's services across the Southern Europe, South America, and South Africa (SESA) region. (Courtesy: FairWind)

FairWind, a leader in wind-turbine installation and service solutions, recently appointed Aitor Diaz de Lezana Fernández to the newly created role of regional head of service for Southern Europe, South America & South Africa (SESA).

Diaz de Lezana Fernández brings more than 19 years' experience in the wind sector, having previously held a number of senior positions including head of operations — Mexico, Central America and Caribbean at Siemens Gamesa and LATAM service director at Nordex Group. He was most recently service director — Europe at SPIE Wind, where he led multi-country service teams, built scalable structures and delivered results across Europe.

In his new role, Diaz de Lezana Fernández will lead FairWind's services across the SESA region, including all commercial and business development activity, while executing the company's growing portfolio of service and maintenance projects. He will also focus on strengthening existing long-term partnerships with key customers, while establishing new customer bases across FairWind's service lines.

"I'm thrilled to join FairWind at such a pivotal time for the renewable industry," Diaz de Lezana Fernández said. "There are enormous opportunities to strengthen and grow our footprint in the SESA region, and I'm looking forward to building on a strong service organization that puts people first, delivers value to clients

and contributes meaningfully to the energy transition. FairWind's track record in delivering the highest safety and quality standards really attracted me to the position, and I am eager to further solidify this reputation across the key SESA countries."

"Aitor brings an abundance of industry knowledge and expertise to FairWind," said Jesus Garcia Mallo, SESA regional director. "His proven success in driving business growth across different geographies will be extremely valuable to the business as we continue our strategic growth plan across key regions.

"As the demand for wind-turbine installation continues to increase in line with the demand for clean energy, our services are vital to ensuring a safe and reliable source of wind energy. This means not only delivering new installations to grow capacity but also maintaining and optimizing existing turbines so they continue to perform at their best for years to come." Founded in 2008 and headquartered in Vejle, Denmark, FairWind has more than 2,200 technicians operating in more than 40 countries. The company offers full-scope wind-turbine services across the lifecycle of renewable energy assets. As FairWind gears up for further global growth, the appointment of a regional head of SESA becomes the company's second newly created role this year, after Alexandra Hof was appointed as the company's first regional head of service for Northern Central Europe in July.

MORE INFO www.fairwind.com

MANUFACTURING

Vestas takes over factory operations near Poland

Vestas has taken over operations at the onshore blades factory in Goleniów near Szczecin, Poland, previously owned by LM Wind Power, following an agreement in May and the com-



Vestas continues to expand its manufacturing footprint in Europe. (Courtesy: LM Wind Power — Goleniów)

pletion of all necessary regulatory approvals.

The acquisition marks another step in Vestas' strategic expansion of its European manufacturing footprint and supply chain to meet future demand and contribute to Europe's growing need for secure, affordable, and sustainable energy.

The factory was established in 2009, expanded in 2017 and will continue to deliver blades for Vestas onshore wind solutions, including the V172-7.2 MW EnVentus turbine.

"Strengthening our manufacturing capacity is essential to meet Europe's

need for secure, affordable, and sustainable energy, and expand our industrial competitiveness," said Felix Henseler, Vestas' chief technology and operations officer.

"The addition of the Goleniów factory reinforces our commitment to scaling the wind industry, and it underlines how Europe can spur wind industry investments and jobs with the right long-term policy commitments for wind energy."

All the approximately 400 former LM Wind Power employees are retained, which increases Vestas' footprint in Poland to almost 2,000 employ-

ees. Vestas also operates an assembly factory in Szczecin, which manufactures hubs and nacelles for the V236-15.0 MW offshore wind turbine.

Together, these two facilities strengthen Vestas' ability to serve both onshore and offshore markets in Europe and globally.

The company believes strongly in the potential of the Polish market and remains committed to investing in local manufacturing and talent to support the region's energy ambitions. ↘

MORE INFO www.vestas.com

CROSSWINDS

THE FUTURE OF WIND



ANTI-RENEWABLE
POLICIES ARE
GOING TO COST
CONSUMERS

The administration is not just targeting offshore wind; it has set its sights on onshore utility-scale solar and wind, as well. (Courtesy: Shutterstock)

Stop-work orders for wind undercut investor confidence in financing all energy projects.

By DENNIS WAMSTED

The administration's energy dominance agenda will fail, done in by collapsing investor confidence, unless the White House stops issuing stop-work orders for offshore wind. Undercutting these projects, each of which has billions of private investment dollars committed to it, is sending shock waves through all energy project financing, not just the wind industry.

The cost of this political uncertainty will raise the risks — and therefore, the costs — of developing other new power generation resources, including new nuclear facilities (both small modular and conventional large reactors), dispatchable battery storage, solar, and gas-fired plants.

Renewable energy and dispatchable storage are the only option for adding significant amounts of new generation capacity to the U.S. grid for at least the next five years. Adding power from gas-fired plants through 2030 is severely limited by turbine manufacturing constraints, and the administration's efforts to keep aging and unreliable coal plants open will cost consumers dearly.

Meanwhile, any new conventional nuclear could take as long as two decades to finish, and small modular reactors are also years away from coming online; their technology and cost-effectiveness remain unproven. Even so, the administration is injecting political and financial uncertainty into wind and solar development projects.

REVOLUTION WIND PROJECT

The latest stop-work move occurred August 22, when the Interior Department's Bureau of Ocean Energy Management ordered Ørsted to stop construction on the almost-finished Revolution Wind project being built off the coast of Rhode Island. The project, a 50-50 joint venture between Ørsted and private equity firm Global Infrastructure Partners, will have a capacity of 704 MW when complete. Ørsted says 45 of the project's 65 turbines have been installed, with commercial operations slated to begin in 2026. The developers have signed offtake agreements with three New England utilities for the power beginning in 2026 and running through 2046.

The reason for the stop-work order? Undefined "concerns related to the protection of national security interests of the United States."

The origin of those national security concerns is not explained, and the contractor list involved in building the project is full of U.S. and European firms, including Siemens, a major supplier in the U.S. for both wind and gas-fired turbines. Earlier this year, in the administration's initial effort to derail offshore wind development, it temporarily stopped construction of the 816 MW Empire Wind project being built to serve the New York market. The stop work order was ultimately lifted after a deal was reached between New York Gov. Kathy Hochul and the administration, but the stoppage cost developer Equinor roughly \$200 million.

Experience shows offshore wind is a reliable resource in the Atlantic off the East Coast. The largest completed project, Ørsted's 132 MW South Fork Wind facility east of Long Island, New York, has posted a 46.3 percent capacity factor in its first 11 months of operation. More importantly, during the winter, when gas prices in both New York and New England are typically highest because of competing demands for power generation and home heating, the facility posted a capacity factor of 53.7 percent. For comparison, the annual capacity factor of U.S. coal-fired generation in 2024 was 42.6 percent, while gas-fired combined cycle units recorded a system-wide capacity factor of 59.7 percent.

An IEEFA analysis completed in early 2024 showed four projects then under construction or in advanced development — Revolution Wind, Vineyard Wind (806 MW), and New England Wind 1 and 2 (1,871 MW) — and scheduled for commercial operation by 2029 could have generated more than 15 percent of New England's average daily power demand during the winter months when gas supplies are tight and prices are high.

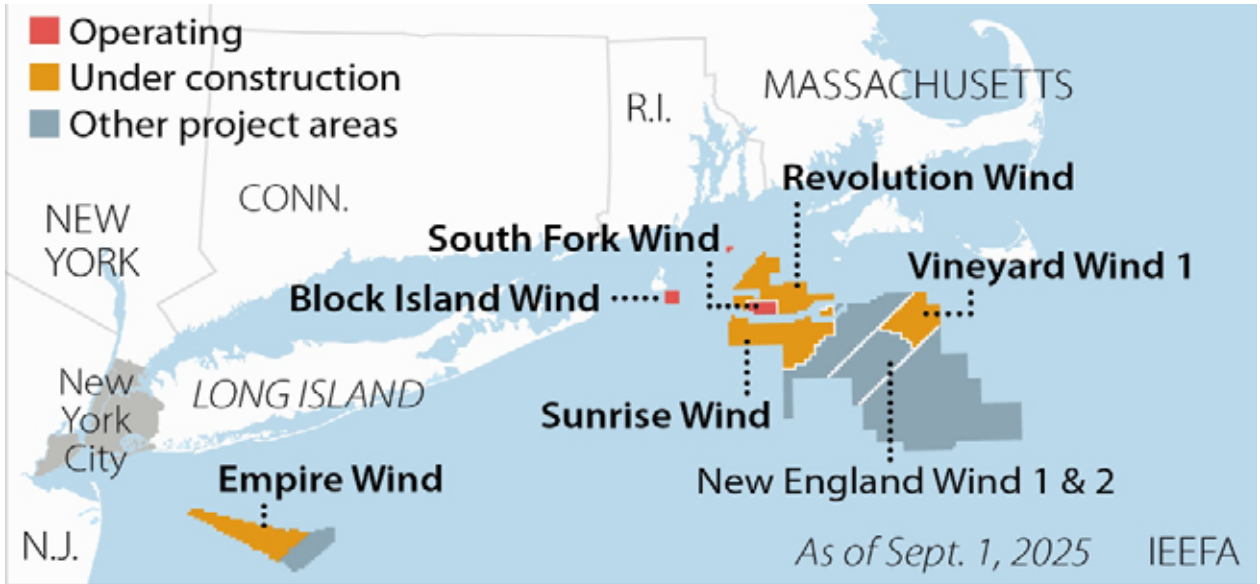
NO OTHER SHORT-TERM ALTERNATIVES

The future of these projects is now in doubt due to the administration's opposition, but there are no other short-term alternatives. The supply of gas turbines is effectively sold out until 2030; new nuclear is 10 years away, and the one remaining coal plant in the region is already 65 years old (ancient by coal standards) and extremely expensive.

In other words, the stop-work orders are going to raise prices for consumers throughout the New York-New England region and potentially cause supply shortages, especially during the winter. This point was made clearly by ISO-New England, the grid operator for the six-state region, in a statement issued August 25:

"Unpredictable risks and threats to resources — regardless of technology — that have made significant capital investments, secured necessary permits, and are close to completion will stifle future investments, increase costs to consumers, and undermine the power grid's reliability and the region's economy now and in the future." EPA Administrator Lee Zeldin told Fox News after the Revolution Wind stop-work order was issued that "the president is not a fan of wind." Politicians of all stripes are entitled to their opinions but forcing a work stoppage at a facility where roughly 80 percent of the work is complete calls into question the trustworthiness of pledges made by the U.S. government.

The current administration is clearly pushing an agenda favoring fossil fuels and nuclear power. But a banker being asked to loan money for such a project — whether a multi-billion-dollar interstate gas pipeline or a new nuclear facility — likely will think hard before lending money to a project that could be stopped at the 11th hour by a future administration.



An IEEFA analysis shows for projects under construction or in advanced development. Courtesy: IEEFA)

And companies looking to build new generation resources are likely to look for more stable investment environments.

LIKELY RISE IN FINANCING COSTS

At a minimum, the current administration's actions are likely to raise the financing costs for some projects. Some could be unfinanceable, such as nuclear projects that require long lead times and have extremely high capital costs. If an investor-owned utility is relying on federal government financial support for a nuclear project, state regulators are likely to have second and even third thoughts before approving such a deal, given the massive economic risks it would place on the utility's ratepayers.

This point, that the government is undercutting the private sector's trust in federal commitments, has been made by several energy insiders over the past few months. Commenting on the Energy Department's decision to rescind a conditional \$4.9 billion loan to help build an 800-mile-long transmission line from Kansas to Illinois, Sen. Martin Heinrich, D-N.M., said: "I am concerned that the federal government is eroding what little trust the private sector has in our ability to be reliable partners."

A similar point was made by Neil Chatterjee, former chair of the Federal Energy Regulatory Commission, at a meeting hosted by BloombergNEF in April. Talking then about the administration's decision to stop work at the Empire Wind project, Chatterjee stated the obvious: "If you're oil and gas, you don't want to set this precedent that you have an approved permit that could potentially be rescinded by a future administration. How do you make those kinds of investments?"

That uncertainty also applies — perhaps more so — for developers looking to build new nuclear plants, whether large or small.

"Commercial banks are not going to provide low-cost financing for nuclear reactor construction — especially initial investments in these technologies," said Katy Huff, assistant secretary for nuclear energy in the Biden administration, this summer. That means, she added, that federal government support will be vital in any nuclear buildout; left unsaid was what happens if developers and bankers no longer trust the government to fulfill its part of the bargain.

NOT JUST WIND

The administration is not just targeting offshore wind; it has set its sights on onshore utility-scale solar and wind, as well. One credible estimate projects that the administration's tightening of rules for the soon-to-expire investment and production tax credits will result in the cancellation of 60,000 MW of new solar generation in the coming five years.

Assuming a 25 percent capacity factor, the 60,000 MW in lost solar would have generated 131 million MWh annually. Making up for that capacity would require the construction of 25,000 MW of new gas-fired combined cycle capacity operating at a 60 percent capacity factor.

But building additional gas capacity simply is not possible in the next five years, so electricity reserve margins will tighten and prices will rise — all because of the administration's anti-renewable campaign.

It would be great if wiser counsel could change the administration's course. The result of not including renewables in a policy of energy dominance means everyone is going to be paying more for electricity in the years ahead. The blame will fall fully and fairly on the decisions made now. ✎

ABOUT THE AUTHOR

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AD INDEX

American Clean Power	5
American Wire Group.....	7
ASM International.....	17
ColdSnap Towers.....	29
Composite Inspection & Consulting (CICNDT)	27
Dellner Wind Solutions	1
Elevator Industry Work Preservation Fund	IBC
Heico Fasteners, Inc.	11
Kapp GmbH & Co. KG	IBC,BC
Malloy Electric.....	25
Oceantic Network	3
Stahlwille Tools LLC	38

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