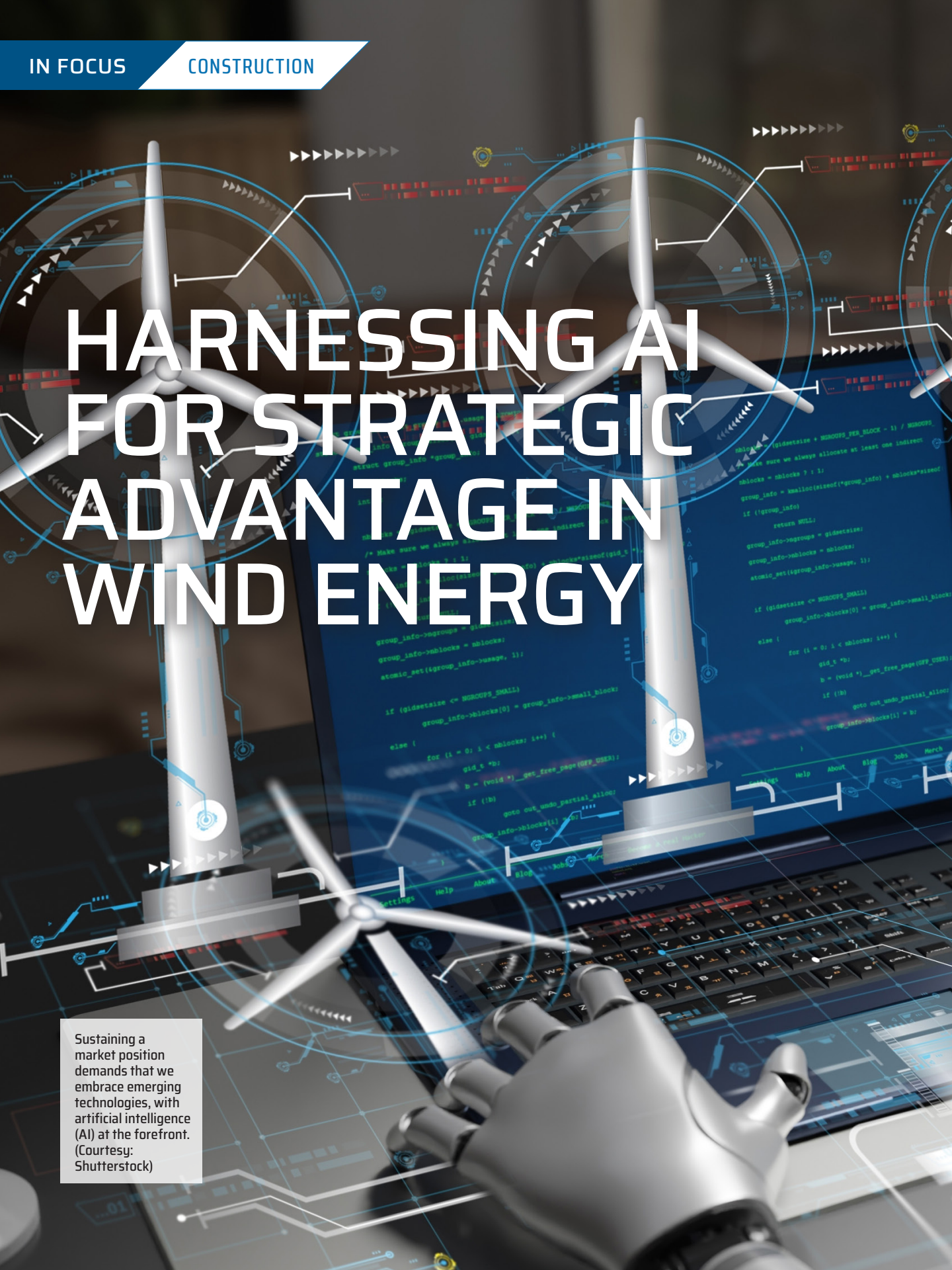
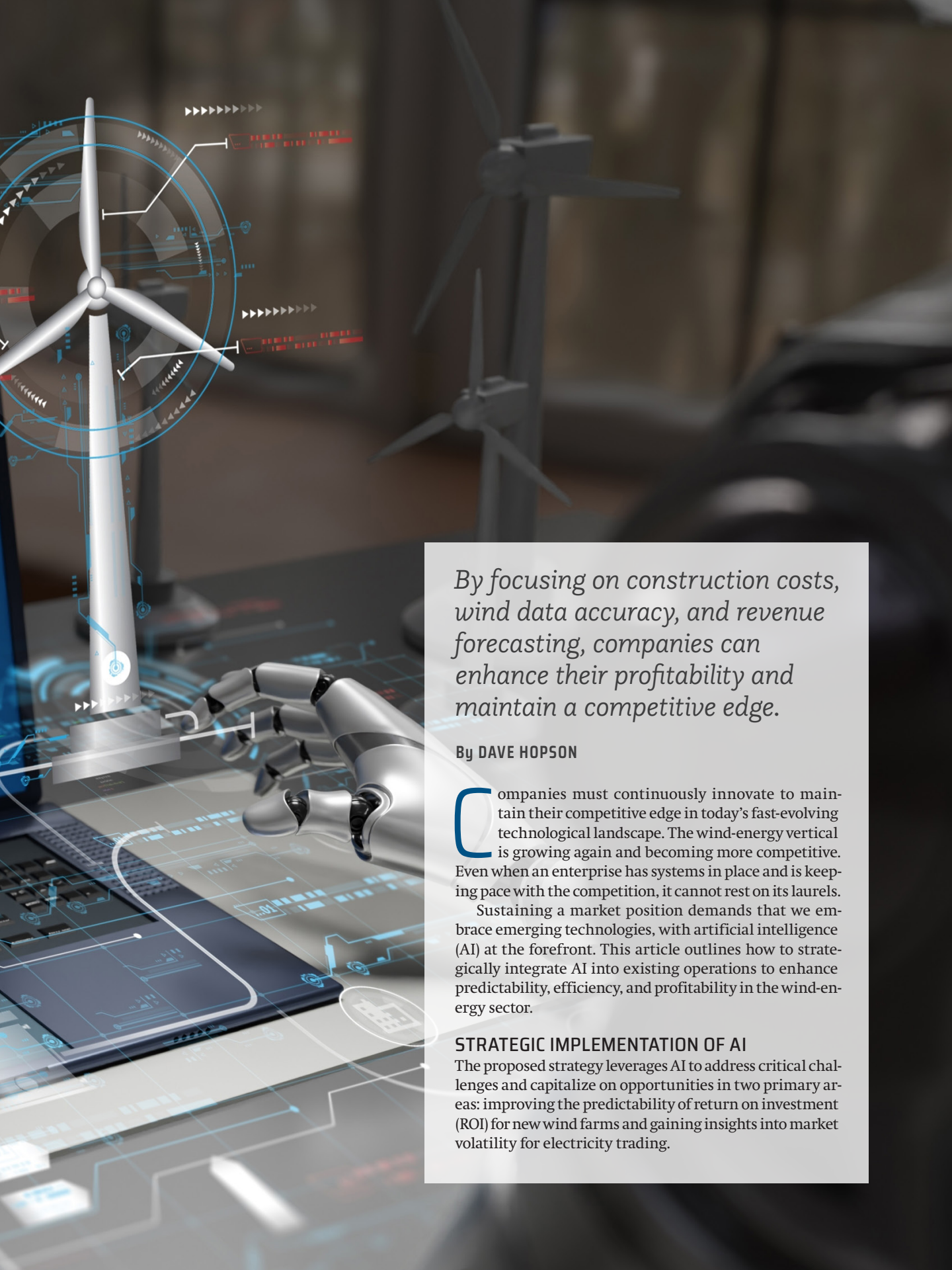
HARNESSING AI FOR STRATEGIC ADVANTAGE IN WIND ENERGY



Sustaining a market position demands that we embrace emerging technologies, with artificial intelligence (AI) at the forefront. (Courtesy: Shutterstock)



By focusing on construction costs, wind data accuracy, and revenue forecasting, companies can enhance their profitability and maintain a competitive edge.

By DAVE HOPSON

Companies must continuously innovate to maintain their competitive edge in today's fast-evolving technological landscape. The wind-energy vertical is growing again and becoming more competitive. Even when an enterprise has systems in place and is keeping pace with the competition, it cannot rest on its laurels.

Sustaining a market position demands that we embrace emerging technologies, with artificial intelligence (AI) at the forefront. This article outlines how to strategically integrate AI into existing operations to enhance predictability, efficiency, and profitability in the wind-energy sector.

STRATEGIC IMPLEMENTATION OF AI

The proposed strategy leverages AI to address critical challenges and capitalize on opportunities in two primary areas: improving the predictability of return on investment (ROI) for new wind farms and gaining insights into market volatility for electricity trading.

Using historical data from wind farms, enterprises can develop AI models to predict the true cost of planning, pricing, and contracting construction projects. (Courtesy: Shutterstock)

1. ENHANCING ROI PREDICTABILITY

A wind farm's performance is pivotal to the industry's (hereafter, the farm industry will often be referred to as The Group) margins. Currently, if all projects met planned expectations, The Group's margins could be 20 percent higher. AI offers a solution to achieve this by refining wind studies and reducing construction cost overruns. As an industry, wind energy can use its extensive confidential data on wind prediction and construction to train machine learning models, resulting in more accurate algorithms for these predictions. By doing so, companies can significantly reduce the risk of underperforming wind farms and avoid costly investments in unsuitable locations.

2. AUTOMATING MARKET VOLATILITY INSIGHTS

Market volatility presents both risks and opportunities in electricity trading. Leveraging AI, The Group can create advanced models that provide actionable insights into market fluctuations. By integrating revenue data with real-time market information from a pricing partner, enterprises can develop robust rules and algorithms for spot market operations. This will enable the ability to automate trading decisions, optimize profitability, and reduce exposure to market risks.

CURRENT TECHNOLOGICAL LANDSCAPE

Currently, most companies employ basic machine learning for predictive maintenance on wind turbines. Usually, a proprietary database collects sensor data and uses historical failure data to predict necessary actions, helping to reduce downtime and maintenance costs.

Additionally, wind-farm planners use proprietary and off-the-shelf wind flow models that analyze data from anemometers at proposed locations. These models, which compare predictions against actual performance, are crucial for determining the feasibility of new wind-farm sites.

Market pricing models such as MarketWatch™ are also used to estimate electricity market pricing, aiding in strategic trading decisions.

AI-DRIVEN STRATEGIC ENHANCEMENTS

By implementing AI, the industry can revolutionize predictive models in three key areas:

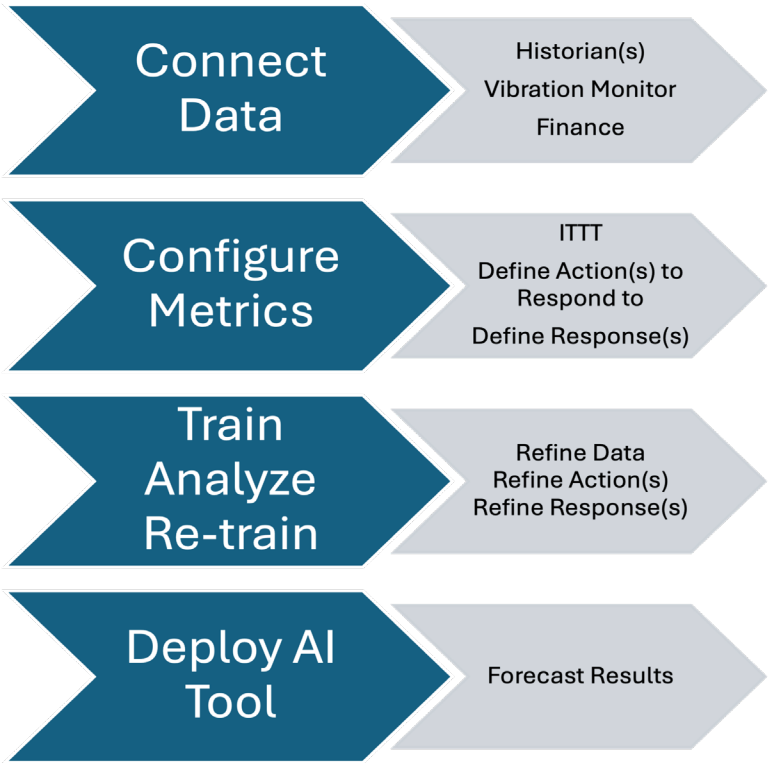
1. CONSTRUCTION PLANNING AND COSTING

Using historical data from wind farms, enterprises can develop AI models to predict the true cost of planning, pricing, and contracting construction projects. This will provide a more accurate financial outlook, enabling better budgeting

and cost control. With advances in AI development, the building of these models has been reduced significantly. While The Group has pored over project plans and wind analysis on underperforming wind farms, these AI solutions have yet to have natural language processing (NLP) to use all the human language sources such as e-mail, SharePoint files, etc. Adding these data sources can provide valuable insights into where projects go wrong earlier and what was missed in the baseline plan. This insight might even change the direction of a build.

2. WIND DATA ANALYSIS

AI has the potential to refine wind-prediction models, enhancing the accuracy of forecasts for wind-farm production. This can be achieved by analyzing extensive data sets from past projects, leading to more reliable predictions of kilowatt-hour output. In this instance, using machine learning (MM), the discrete data of the two data sets can create an ever-evolving wind analysis that will outperform anything in the market. In fact, it will specialize to an individual entity. Using the NLP tools mentioned previously, the industry can look at the reports of the analysis and find missed predictions and how to fix them, which might influence the location of a proposed wind farm.



AI has the potential to refine wind-prediction models, enhancing the accuracy of forecasts for wind-farm production. (Courtesy: Triumphus)

3. REVENUE FORECASTING

Integrating AI with existing market pricing models, revenue forecasts can be refined by comparing predicted and actual prices over as many years of data that is available. This will improve the ability to anticipate market trends and adjust trading strategies accordingly. Again, this would use machine learning against all discrete forecast data and actual results. The result will be a personalized forecasting tool specific to the enterprise.

CHALLENGES AND FUTURE DIRECTIONS

While AI holds great promise, there are challenges to its widespread adoption in the wind-farm industry:

- **1. Data quality and availability:** High-quality, extensive datasets are crucial for training effective AI models. Ensuring the availability and reliability of such data remains a challenge. Although, as highlighted earlier, the data is there.
- **2. Integration with existing systems:** Integrating AI solutions with legacy systems and ensuring interoperability can be complex and costly. Be sure to take the time to get the right tools for all systems.
- **3. Regulatory and ethical considerations:** The use of AI raises regulatory and ethical concerns, particularly regarding data privacy, security, and decision-making transparency. Across the AI industry, many uses require us to worry about these things. However, in this use case of AI, enterprises should worry about protecting their proprietary data from disclosure to the public.

Despite these challenges, the future of AI in the wind-farm industry looks promising. Continued advancements in AI technologies and growing investments in renewable energy are expected to drive further innovation. As AI systems become more sophisticated and accessible, their impact on the efficiency, sustainability, and profitability of wind energy will continue to grow.

CONCLUSION

Integrating AI into an enterprise's operations will elevate its ability to predict, plan, and execute wind-farm projects with greater precision.

By focusing on construction costs, wind data accuracy, and revenue forecasting, companies can enhance their profitability and maintain a competitive edge. This strategic use of AI aligns with the core principles of cost leadership and focus, ensuring enterprises can continue to thrive in the dynamic wind energy sector.

ABOUT THE AUTHOR

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