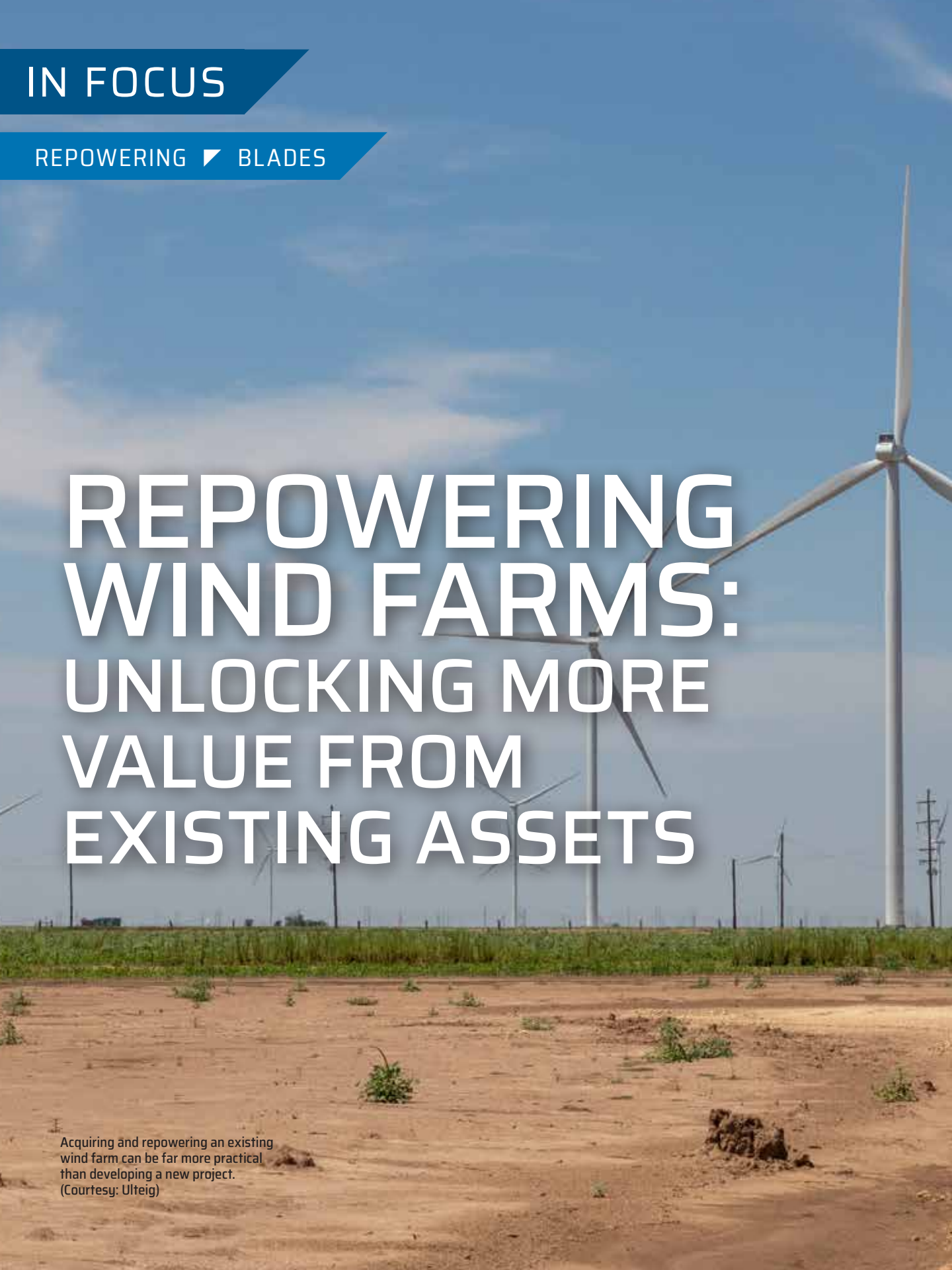
REPOWERING WIND FARMS: UNLOCKING MORE VALUE FROM EXISTING ASSETS



Acquiring and repowering an existing wind farm can be far more practical than developing a new project. (Courtesy: Ulteig)

Repowering is often one of the most cost-effective and environmentally efficient strategies for wind-farm operators managing mature assets.

By PHILLIP LOY

Wind remains a major contributor to the U.S. energy mix, but one of the sector's most significant growth opportunities may come less from new footprints and more from existing ones.

According to the US Energy Information Administration, wind and solar together generated a record 17 percent of U.S. electricity in 2025, with wind alone producing 464,000 GW/h. At the same time, a growing share of the U.S. wind fleet is reaching the point where owners must weigh the cost of maintaining aging equipment against the value of upgrading it. Repowering is becoming an increasingly practical way to extend project life, improve performance, and capture more generation from sites that already have land rights, infrastructure, and grid access.

Wind technology has advanced rapidly over the past decade. Newer turbines use larger rotors, taller towers, and more sophisticated controls to capture more energy at a lower cost per megawatt-hour. According to the U.S. Department of Energy, wind turbines continue to grow in size and power, with the average nameplate capacity of newly installed wind turbines at 3.5 MW in 2024, compared to about 2.8 in 2020.

Let's put it another way: A single, 3.5-MW typical wind turbine installed today can generate enough electricity to power 1,000 average American homes for an entire year, a significant increase over the average 2.8 MW wind turbine built in 2020 that could power approximately 800 homes (epa.gov). In practical terms, this means owners can increase production with fewer machines and a smaller maintenance burden.

But these results are not just limited to newly built wind farms using the latest technology.

FACTORS TO CONSIDER FOR REPOWERING

Repowering decisions typically begin with a straightforward question: Does it make more sense to continue maintaining legacy equipment or to upgrade key components or entire turbines to capture more value from an existing site? For many project owners, the answer increasingly depends on how older assets compare with today's technology in output, reliability, and long-term operating cost.

According to data analytics firm Wood Mackenzie, many owners are already using upgrades to extend asset life and

Repowering decisions typically begin with a straightforward question: Does it make more sense to continue maintaining legacy equipment or to upgrade key components or entire turbines to capture more value from an existing site? (Courtesy: Shutterstock)

improve project economics, forecasting that global cumulative repowering capacity will increase from just more than 21 GW in 2023 to 134 GW by 2033. It notes, "Repowering a turbine by replacing an aging platform with a newer, larger model is the most effective way an operator can increase the efficiency and output of their wind portfolio."

Recent academic research on the long-term opportunity in the U.S. backs this up, suggesting that under the right conditions, repowering existing U.S. onshore wind sites could more than double the current nameplate capacity from 153 GW to about 314 GW.

For owners evaluating mature assets, that potential makes repowering not just a maintenance decision, but a strategic generation and infrastructure decision.

For owners evaluating whether a project is a strong candidate for repowering, several indicators tend to merit closer review, particularly when site conditions and wind resources remain favorable:

- **Age:** Projects commissioned a decade or more ago often use turbines that are substantially smaller and less efficient than those available today. That gap alone can justify a performance and economic assessment.
- **Performance trends:** Declining output over time may indicate turbine deterioration, technology limitations, or site-specific constraints that warrant closer analysis.
- **Maintenance costs:** Rising spending on blades, drivetrains, and other major components can shift the economics toward repowering, particularly when downtime and long-term reliability are factored in.

A repowering assessment usually considers several interrelated factors:

- **Maintenance cost trajectory:** How quickly operating and repair costs are increasing as infrastructure ages.
- **Replacement cost exposure:** The cost and availability of major components needed to keep legacy turbines operating.
- **Opportunity cost:** The potential for newer equipment to increase generation, improve availability, and strengthen project economics.
- **Interconnection implications:** Whether increased output would trigger upgrades, amendments, or new interconnection requirements.

Repowering is often one of the most cost-effective and environmentally efficient strategies for wind-farm operators managing mature assets. Many core components, such as substations, transmission lines, underground cables, and transformers can last up to 40 years, and repowering allows operators to fully leverage that long-term infrastructure. In today's environment, where interconnection queues and permitting processes often take years to complete, sites that are already online offer a distinct advantage.

Acquiring and repowering an existing wind farm can be far more practical than developing a new project from the ground up and often has minimal regulatory approvals as compared to a new site.

Certainly, for projects with strong wind resources, established site control, and viable interconnection infrastructure, routine repowering assessments can help owners lower lifecycle costs, extend asset life, and generate more energy from land already in service.

ABOUT THE AUTHOR

Phillip Loy is an Ulteig renewable lead engineer.