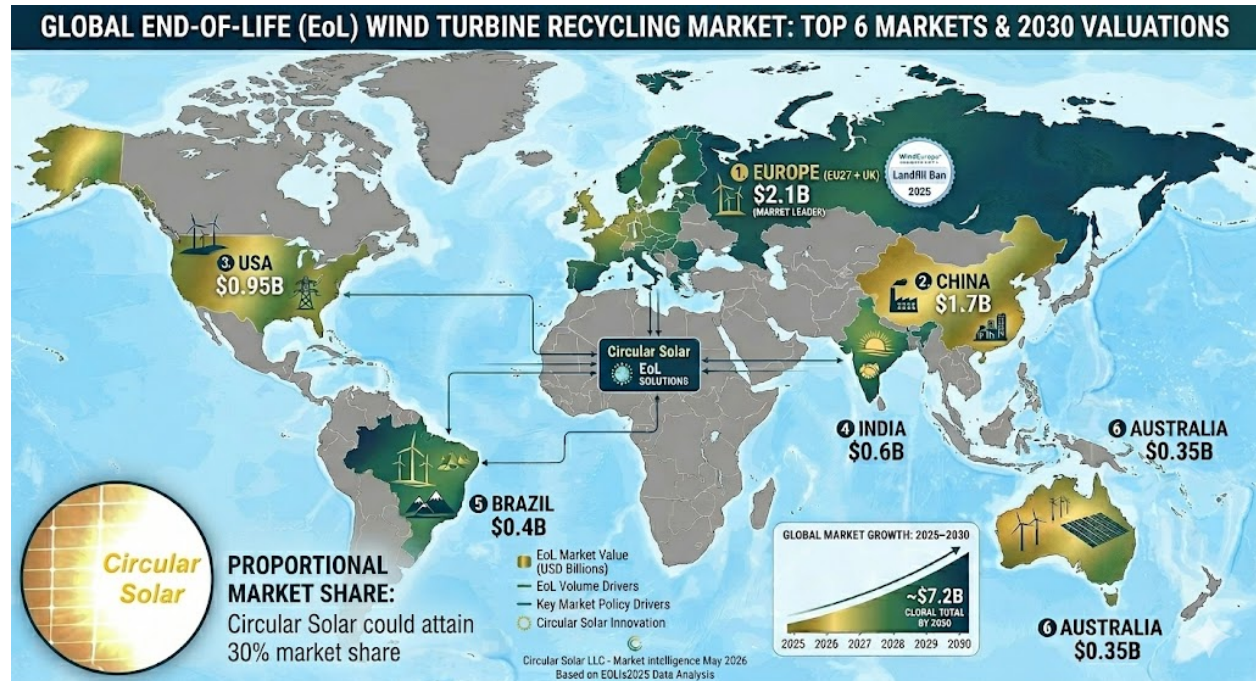


Whitepaper **Circular Solar Wind: Achieving 100% Lifecycle Repurposing and Recycling for Wind Turbines**

Based on the Presentation by Founder/CEO Cherise Petker at Wind Europe's EOLis2025 Recycling Conference Prepared by Circular Solar LLC, CircularSolar.net, November 2025



Total value includes high value e-waste critical minerals. The company who can 100% recycled the zero value, hard to recycle composite blades, nacelle's also deserve revenue streams from recycled e-waste supply-chains.

Executive Summary

Wind energy is a cornerstone of the global renewable transition, but end-of-life (EoL) challenges—particularly blade and nacelle recycling—threaten its sustainability. Average recycling rates hover around 90%, with persistent issues from landfills, PFAS contamination, corrosion, fires, and cyber threats. Wind Europe's call for a landfill ban by 2025 underscores the urgency. Circular Solar LLC, led by Founder/CEO Cherise Petker, offers a comprehensive solution that closes the loop to 100% repurposing and recycling. By integrating wind composites into solar-battery farms, sustainable concrete, pollution control, and advanced drones, Circular Solar transforms EoL wind materials into high-value assets.

Key innovations include Circular Solar Nanorocks for farmland protection, albedo-enhanced bifacial solar yields (up to 15–24% gains), OCTOPUS drones (our designs, innovations for drones since testing parts of it since 2022), REE recovery from generators, and corrosion reduction. Market projections highlight a massive opportunity: the global EoL wind recycling market is on track to reach approximately \$1 billion by 2030. Circular Solar is positioned to capture 30% market share, potentially generating \$300 million in value (detailed below), with hybrid microgrid upside pushing total potential to \$400–850 million+. This whitepaper expands

on the EOLis2025 presentation, detailing the problems, solutions, technical foundations, market assessment, and compelling business case for hybrid wind-solar projects.

The Challenges Facing Wind Turbine Recycling

Wind turbine blades and nacelles present unique recycling hurdles due to their composite materials (glass/carbon fiber, epoxy resins, PFAS). Key issues highlighted in the presentation include:

- Low effective recycling rates (~90% average), with much material downcycled as supplementary cementitious material (SCM) in concrete—competing against cheaper virgin materials—or used as low-BTU waste-to-energy (WtE) fuel that emits toxins and plastics.
- Landfill impacts and policy pressure: Opponents cite visual and environmental burdens. Wind Europe’s 2025 landfill ban is driving change, yet chemical recycling remains costly.
- Operational failures: Corrosion, oil leaks, lightning strikes causing fires, and composite debris polluting soil/water.
- Emerging contaminants: PFAS threatens farmland, groundwater, wildlife, and drinking water.
- Cyber and geopolitical risks: The February 24, 2022, Russian cyberattack disabled SATCOM modems in 5,800 ENERCON turbines across 1,217 U.S. wind farms. Materials are often exported interstate (e.g., from Wyoming, Iowa, Texas), with California aligning to EU policy.
- Policy context: U.S. DOE reports and California policies reference albedo effects and environmental considerations. Cherise Petker’s letter to the U.S. Department of Commerce (Sec. 232 Wind investigation) emphasized cybersecurity, drone-based maintenance, and defense applications.

Repurposing (e.g., into bridges or e-bike paths) is promising but insufficient alone and Circular Solar repurposes back into its original use; generating renewable energy.

Circular Solar’s Vision: Turning Problems into Solutions

“What if the problems with wind are solutions for solar-battery projects, pollution control infrastructure, innovative circular concrete, and drones (UAVs)?” — Presentation core question. Circular Solar closes the loop to 100% through six integrated innovations:

1. Reducing corrosion to extend asset life and minimize failures.
2. Circular Solar Nanorocks placed below turbines protect farmland, soil, groundwater, and wildlife from leaks, PFAS, and epoxy dust.
3. Solar-battery farms with agrivoltaics: Safe cattle shade structures generate 15% extra solar yield via repurposed wind composites.

4. Solar Canals: for narrower canals and faster to permit, build and deploy with added safety for BESS storage.
5. Innovations for sustainable/recycled concrete: Wind composites downcycled into high-albedo, reflective concrete that reduces urban heat island (UHI) effects and improves EV wireless charging efficiency.
6. OCTOPUS drones: For maintenance, inspection, and potentially defense—addressing cyber threats and operational costs.
7. REEs (rare earth elements) critical mineral streams recovered from generators.

These create synergistic value: wind EoL materials enhance solar performance while addressing pollution and enabling new revenue streams.

Science and Technology Foundations: Albedo Effect and Bifacial Solar Enhancement

Wind composites repurposed as reflective, high-albedo surfaces (simulating fresh snow) unlock 3D solar power generation. Near summer solstice, white composite/glass yields 53 watts vs. 43 watts for brown surfaces—a 24% increase. Live video demonstrations and microgrid testing confirm gains. Fixed, single-axis, or dual-axis tracking setups (including CSP) maximize yields. Nacelles can integrate with battery energy storage systems (BESS).

Sustainable Concrete and Data-Center Applications

Circular Solar products cool concrete (e.g., in Arizona tests, comparable to plastic tarps), improving EV/BESS charging efficiency and reducing heat losses. As an EPRI-OpenAI Consortium member, Circular Solar pilots four use cases for AI data centers: CDR (carbon dioxide removal), high-yield PPAs, cooler/dust-resistant rooftops (reducing water use for cooling), and PFAS breakdown.

Hybrid Microgrids

Repurposed blades/nacelles surround solar panels in microgrids powering AI data centers, EV charging stations, agriculture, barns, highway charging needs, rail depots, and mine sites.

Market Opportunity

Independent assessments confirm the presentation's projection of a ~\$1 billion global EoL wind recycling market by 2030. The map below visualizes estimates for the top markets (EU grouped per conference focus; others by capacity/decommissioning trends): [Insert the corrected map image here — accurate placements: EU on Europe (\$70M/\$350M), China (\$50M/\$200M), US (\$40M/\$200M), India (\$20M/\$100M), Brazil (\$20M/\$150M).]

Circular Solar's Addressable Market Share and Revenue Potential

The presentation explicitly positions Circular Solar to retain 30% of the EoL recycling market

through its proprietary hybrid repurposing model. **This translates to a \$300 million addressable opportunity by 2030.**

Breakdown by Key Markets (30% Share of Map Values):

- EU (grouped): \$105M
- China: \$60M
- United States: \$60M
- India: \$30M
- Brazil: \$45M
- **Total: \$300M**

This potential is grounded in JV/PPA revenue, 25% IP fees, 70% decommissioning cost retention, LCOE reductions, and scalability. Independent reports show broader decommissioning markets reaching \$2–6B+; Circular Solar’s approach captures premium value. Near-term (2026): ~\$60M addressable.

Business Case: Scaled Circular Solar Wind Hybrid Farms at Decommissioning Locations

Repurposed blades/nacelles enable high-value hybrid solar-battery microgrids **directly at wind farm decommissioning sites**. This minimizes transport, retains 70% of decommissioning costs onsite, and generates new revenue through 15%+ extra solar yields via albedo reflectors and Nanorocks for pollution/soil protection.

Core Example (Presentation): .25 MW hybrid farm with \$3,500–4,000 annual savings (LCOE drop ~13%), JV/PPA sharing, and 25% IP fee.

Scaled Scenario – 500 kW Solar + 1 MW BESS Microgrids:

Ideal for colocated deployment where EoL turbines are retired. Wind composites provide reflective surfaces and structural elements; nacelles support BESS integration. These farms supply:

- **Micro data centers:** Cooler rooftops reduce water/cooling costs; reliable solar-BESS power for high-uptime AI/edge computing.
- **EV charging stations:** Onsite generation + BESS for highway/fleet charging with lower costs and grid resilience.
- **Agriculture farms:** Agrivoltaic cattle shade (reduces heat stress, improves milk yield/welfare); power for irrigation pumps, barns, or equipment. Nanorocks protect groundwater.

Economics & Overall Market Value:

- Each 500 kW solar + 1 MW BESS microgrid: ~\$400k–\$800k installed value.

- With 30% EoL material repurposed (~150,000 tonnes blades), this enables hundreds of systems.
- **Total hybrid asset market value: \$500–800 million+** in installed capacity by 2030.
- **Circular Solar’s captured value: \$400–850 million+** (baseline \$300M recycling/IP + hybrid JV/PPA upside).

This model turns decommissioning liabilities into revenue-generating infrastructure — the highest-value repurposing approach.

Conclusion and Path Forward

Circular Solar transforms wind’s end-of-life challenges into circular economy wins: higher solar yields, pollution control, cooler infrastructure, and critical mineral recovery. By achieving 100% recycling rates and scaling hybrid farms at decommissioning locations, the company strengthens the social license for wind while powering data centers, EV infrastructure or agriculture and mine sites and no albedo value generation but as a lower cost, faster to scale solar canal with resilient storage for BESS.

References

All technical and market details drawn directly from Cherise Petker’s EOLis2025 presentation slides. Market projections informed by the presentation’s \$1B global EoL forecast, cross-referenced with Wind Europe, GWEC, TechSci Research, Fortune Business Insights, and other 2024–2026 industry reports. Circular Solar LLC – Tech, Innovation, R&D
Improving lifecycle and potentially reaching 100% wind blade, nacelle repurposing and recycling rates.