Dairy Farm Energy Optimization
SUSTAINABLE ENERGY INDEPENDENCE FOR MODERN DAIRY OPERATIONS

CHALLENGE

Dairy farms face substantial energy costs with high monthly grid bills, driven by 24/7 operations for milking, cooling, and processing. They operate in harsh environments characterized by abrasive particulates during summer harvest, and ice in winter, which degrade conventional energy equipment. The need for reliable cost-effective power is critical to maintain profitability and sustainable operations. Dairy farms face compounding energy pressures:

FINANCIAL BURDEN

High grid electricity costs for 24/7 milking, cooling, and processing loads.

ENVIRONMENTAL EXTREMES

Summer: Abrasive dust degrades equipment
Winter: Ice accumulation disrupts energy generation.

MARKET PRESSURES

Consumers demand verifiable sustainability commitments.

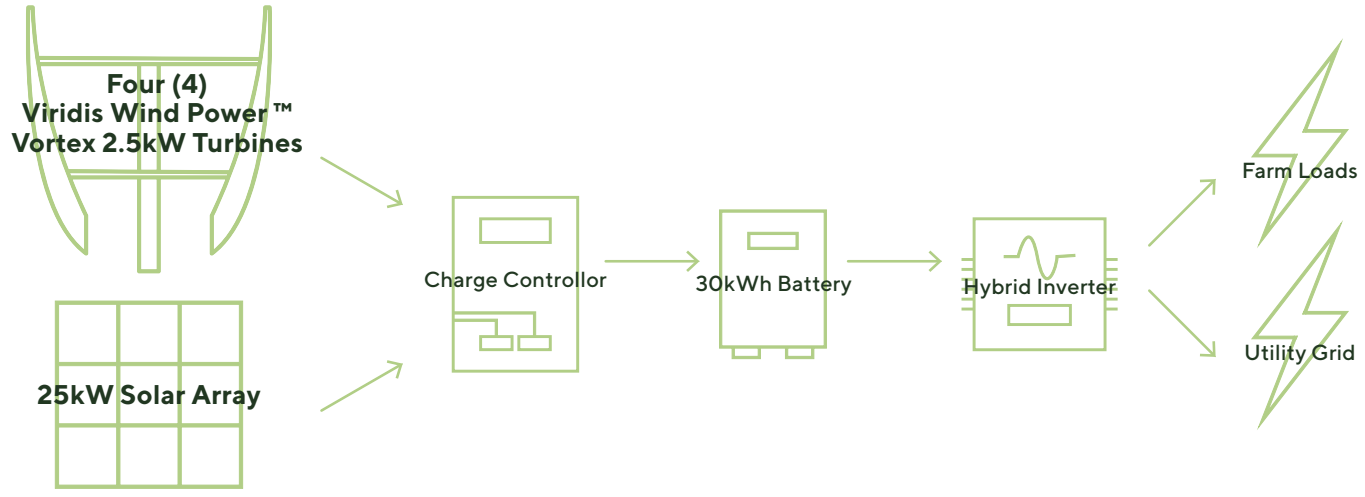
OPERATIONAL VULNERABILITY

Grid outages threaten milk spoilage and herd welfare.

SOLUTION

Four Vortex 2.5kW wind turbines, pole-mounted in open windy fields + a 25kW solar array + 30kWh battery storage, integrated with the grid via net metering. The system features dust-sealed bearings and temperature hardened components for resilience in farm conditions.

A hybrid grid-integrated wind energy system featuring two Vortex 2.5kW turbines with farm-specific hardening:



Farm Optimized Features

DUST RESILIENCE	**Sealed bearings** combat dry season particulates
THERMAL HARDENING	**Components suitable for extreme weather conditions** for reliable year-round operation
GRID INTEGRATION	**Where available to consumers, net metering** exports surplus energy for revenue
BACKUP BATTERY	Provides **backup power for critical loads** during outages

Key Outcomes

30kWh battery provides backup power resilience, maintaining critical refrigeration during grid outages, preventing milk spoilage and financial losses.

~74,400 kWh annnual wind conribution (4 Vortex 2.5kW wind turbines, 9' blades). Complements the solar array, specifically **targeting high-cost** evening power usage and winter months when solar production is lowest.

The hybrid system delivers substantial savings. Wind power alone offsets over $22,000 annually at current commercial rates (~$0.30/kWh). When combined with solar generation, the total system targets ~20-25% reduction in annual grid costs.

Summer: Sealed bearings and filtered electronics **withstand abrasive dust during harvest.** Winter: Cold-hardened components **mitigate ice-related downtime**, ensuring milking operations continue during freeze events.

"Wind-Powered Dairy" branding leverages measurable renewable contributions (e.g., 74,400 kWh/year) for marketing and ESG (Environmental, Social, and Governance) reporting—no greenwashing.

TECHNICAL DIFFERENTIATION: AGRICULTURE-OPTIMIZED ENGINEERING

ALL-SEASON RELIABILITY

Vertical **blades orientation minimizes ice/snow/dust accumulation** versus horizontal designs; **Protective coatings are applied** to actively combat dust/particulate infiltration in dry months.

Sealed bearing enclosures minimize particulate contamination, and **simplified component engineering** allows for **easy maintenance**.

Electronic components are housed in an indoor enclosure for **efficient operation in extreme weather** conditions.

Extreme temperature tolerance is achieved through **specialized resins applied to carbon fiber components**, enabling consistent performance in heat exceeding 45°C.

Low centre of gravity **withstands strong gusts , variable winds**, and **sudden acceleration and deceleration**.

WHY VIRIDIS WIND POWER ™ VERTICAL AXIS WIND TURBINES ?

Output Consistency

Our patented blade technology produces high torque at low wind speeds (5.5 km/h startup), which supports dairy's 24/7 load profile.

Weather Resilience

Energy output is more reliable than HAWTs and solar in cloud, fog, ice, snow, and high particulate environments.

Maintenance Advantage

2-year service intervals with ground-accessible components (no crane requirements).

Value Stacking

Combines energy savings, reliable energy output, and sustainability branding in a single solution.

COMPETETIVE ADVANTAGE: WHY OUR VAWTs PREVAIL IN DAIRY FARMING ENVIRONMENTS

Align with Energy Demand Profiles

Refrigeration is 24/7: Milk chilling and storage require **constant power**, especially at night when solar panels generate **zero** energy. Our VAWTs can harness nighttime winds to power refrigeration compressors, reducing reliance on the grid or batteries.
Peak Demand at Dawn/Dusk: Milking parlors, lighting, and feeding systems peak during low-light hours (early morning/late evening). Winds often strengthen at these times (e.g., temperature-driven breezes), while solar output is minimal.

Space + Location Optimization

Use "Wasted" Space: Install in windy, non-arable areas:
- Along fence lines
- Above manure lagoons (capturing methane-driven updrafts)
- Beside feed storage (where solar would be shaded or dirty)

Avoid Roof Conflicts: Barn roofs often host ventilation, lighting, or equipment – making solar impractical. Ground-mount solar competes with grazing/cropland.
Height Advantage: Can be mounted on existing structures (e.g., silos, tall barns) to access stronger winds without new land use.

Lower Operational Disruption

Minimal Maintenance: Unlike solar panels (which require frequent cleaning from dust, feed, or bird droppings), our VAWTs are largely self-maintaining.
Storm Resilient: Dairy farms operate in all weather. Viridis VAWTs handle rain, snow, and wind gusts better than solar arrays.
No Shading Issues: Equipment, trees, or buildings won't disrupt our VAWT output (unlike solar, where partial shading cuts panel efficiency by 20–50%).

Complementary to Farm Activities

Wind Corridors: Dairy farms often have open fields, creating natural wind channels (e.g., between barns or hills).
Hybrid Potential: Pair Viridis VAWTs with limited solar (e.g., on office roofs) for a balanced renewable mix – wind covers nighttime loads, solar handles midday.
Manure Synergy: Install near anaerobic digesters (common on large dairies) to power biogas processing equipment.

Environmental Impact

1. ECOSYSTEM PRESERVATION

Minimal land grading required for installation **preserves topsoil integrity** and **avoids compaction of grazing areas**.

Silent operation prevents auditory habitat disruption common with diesels/HAWTs.

2. WATERSHED PROTECTION

Zero operational fluids: Sealed drivetrain requires no lubricant changes (vs. HAWT gearbox oil).

Battery safety: Non-toxic battery chemistry options available (LFP).

3. SUSTAINABLE LIFECYCLE

Material advantages validated by third-party Life Cycle Assestments:
High recyclability: Aluminum towers and composite blades exceed solar panel recyclability.

Minimal site impact: Micro-foundations require no concrete in sensitive soils.

4. FIRE RESILIENCE

Critical for wildfire-prone regions:

No ignition sources: Absence of hot exhaust or electrical arcing.

Fire-resistant materials: Blades withstand radiant heat exposure.

Our patented blade design, optimised orientation, and use of advanced, lightweight materials allow for more efficient clean energy production at a lower overall cost.