

Remote Indigenous Off-Grid ENERGY RESILIENCE FOR CRITICAL COMMUNITY LOADS

CHALLENGE

A small coastal community of ~50-100 people is vulnerable to diesel supply disruptions and high costs. They want to secure power for their most critical infrastructure: the Water Treatment Plant, Health Clinic, and Community Centre. This remote coastal community is constrained by a dual challenge: severe environmental conditions and total dependence on expensive, imported diesel fuel.



FREEZING SPRAY

Ice accumulation (~20°C) stalling horizontal blades and sensors.



SALT CORROSION

Rapid degradation of metal components in relentless sea spray.



EXTREME WINDS

120+ km/h storm gusts that cripple conventional turbines.



GRID INSTABILITY

The lack of a stable central grid necessitates a self-sufficient and resilient standalone power system.



REMOTE MAINTENANCE

Geographic isolation requires extreme equipment reliability and simple, local maintainability.



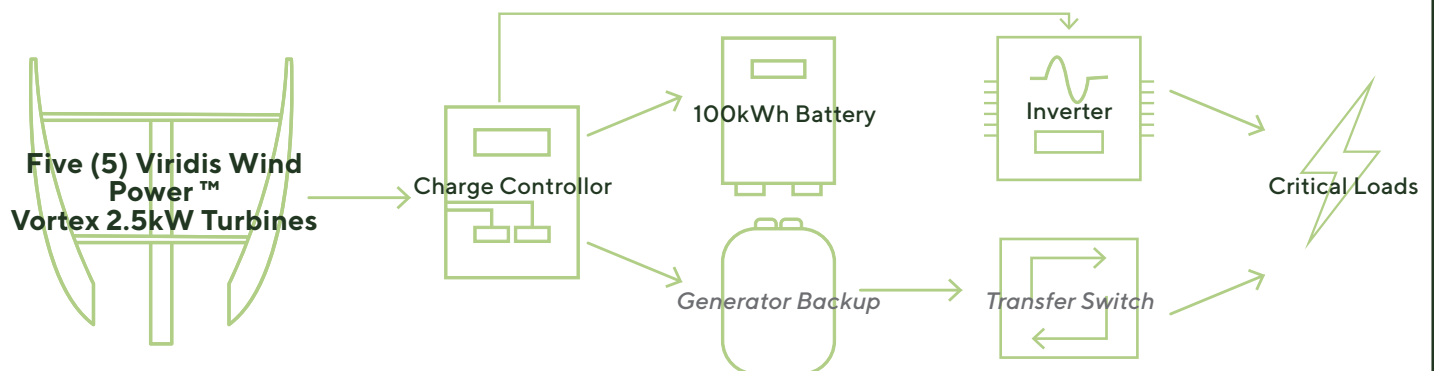
PRICE VOLATILITY

Reliance on diesel generators leave the community vulnerable to volatile and high fuel costs.

SOLUTION

A dedicated critical loads micro-grid with five Vortex 2.5kW turbines (platform-mounted on sturdy coastal pilings) + existing diesel + a 100kWh battery bank. This system is designed to be decoupled from the main community grid to ensure these essential services never lose power. Local maintenance training included.

The Vortex 2.5kW VAWT microgrid delivers resilience through marine-optimized engineering:



Key Resilience Features

CARBON FIBRE BLADES

Carbon fibre construction **mitigates corrosive buildup**

MARINE-GRADE ALLOYS

Resist pitting corrosion for extended operational lifespan in saltwater environments

SMART LOAD MANAGEMENT

Ensures **autonomous operation of critical infrastructure**, forming a **secure micro-grid** independent of the main diesel supply

COMMUNITY OWNERSHIP

Local technician training embedded

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Key Outcomes

93,000 kWh annual wind generation (18,600kWh per VAWT) ensures the community's water, health, and gathering places are immune to diesel shortages and price spikes.

The successful operation of this focused microgrid **provides a model and foundation for future community-wide expansion.**

Immediate and predictable savings by reducing diesel imports by **10-15% annually, freeing up community funds for other vital needs.**

Establishes a resilient hub at the health clinic and community centre, **ensuring continuous operation during grid outages or emergencies.**

TECHNICAL ADVANTAGES



1. CORROSION DEFENCE SYSTEM

Blades

Specialized anti corrosive coatings significantly reduce surface degradation in marine environments.

Bearings

Multilayerd sealing combined with corrosion-inhibiting treatments prevents saltwater intrusion while maintaining lubrication integrity.

Fasteners

Marine-optimized materials resist pitting and galvanic corrosion from constant salt exposure.

Electronics

Engineered sealed enclosures block humidity and salt fog penetration during storm conditions.



2. STORM SURVIVAL ENGINEERING

Aerodynamic Stability

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

Ice Mitigation

Vertical blades shed freezing spray faster than Horizontal Axis Wind Turbines (HAWTs).

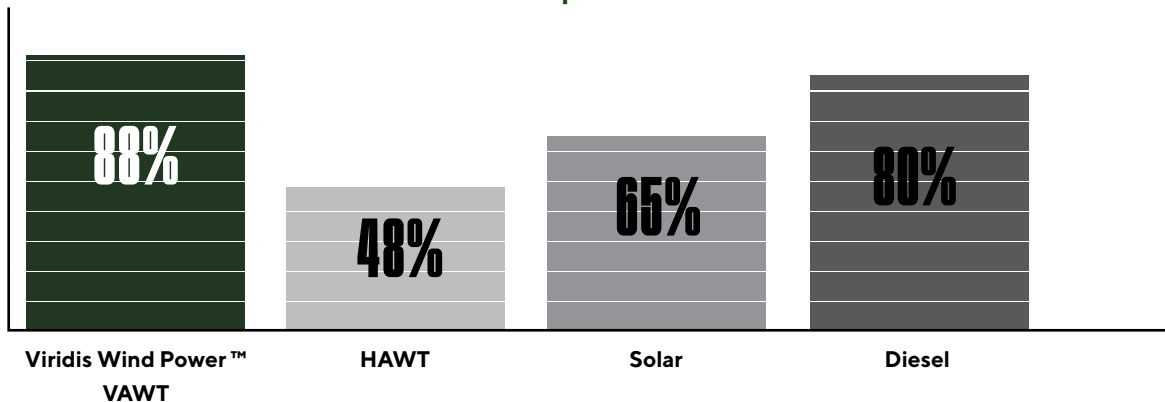
Flood Resilience

Achieved through comprehensive site assessment to determine turbine placement that avoids coastal inundation risks while maximizing energy capture.



3. COMPETITIVE ADVANTAGE

**10 Year Reliability:
Percent Operational**



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Why our Vortex 2.5kW VAWT Prevails in Coastal Environments:

VERSUS SOLAR

Maintains full output during prolonged coastal fog and overcast conditions that reduce solar energy generation by 40–60% seasonally. Operation is unaffected by daylight limitations or particulate accumulation on surfaces.

VERSUS DIESEL

Ensures reliable uptime for critical services like the clinic and water plant, eliminating their diesel dependency; Shields the budget with immediate, predictable savings on the most vital energy loads; and Prevents catastrophic blackouts for essential services during storms or supply delays.

VERSUS HAWTs

Inherently captures wind from any direction without complex orientation systems, ensuring consistent energy production in shifting coastal winds where HAWTs lose efficiency during directional changes. This eliminates mechanical failures associated with yaw mechanisms in salt-laden environments.

Environmental Impact

1. LOCALIZED AIR QUALITY IMPROVEMENT

Eliminates harmful diesel emissions (NOx, SOx, particulate matter) **at their most sensitive locations**—directly improving air quality around the health clinic and community center.

3. NOISE POLLUTION REDUCTION

Replacing the constant drone of diesel generators near key buildings with near-silent wind power restores the natural soundscape, reducing noise pollution and enhancing the tranquility of the community.

5. WATERSHED PROTECTION

Elimination of Lubricant Waste: Sealed drivetrain requires no operational fluids, permanently removing the risk of gearbox oil leaks and the associated soil and water contamination from turbine maintenance.

Non-toxic Battery Chemistry Option: Nontoxic Lithium Iron Phosphate (LFP) chemistry provides stable, long-lasting storage without the fire risks of other lithium-ion batteries, ensuring community safety is never compromised.

2. MARINE ECOSYSTEM PROTECTION

Reducing fuel barge deliveries also reduces spill risks, **safeguarding critical shellfish beds, salmon habitats, and traditional harvesting grounds from hydrocarbon contamination.**

5. CIRCULAR DESIGN

Fully recyclable steel or aluminum towers, **diverting end-of-life materials from landfills**, and the **ability to repair and downcycle** composite blades.

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