African Community Micro-Grid
ENERGY INDEPENDENCE FOR REMOTE AFRICAN VILLAGE

CHALLENGE

A village in rural East Africa with a population of ~300 people (~60 households) faces interconnected crises stemming from absolute energy poverty. Daily life depends on hazardous kerosene lamps and inefficient wood fires for household needs, while critical institutions like clinics and schools rely on sporadic diesel generators. This creates a self-reinforcing cycle of health risks and economic strain. The region's environmental conditions—including frequent dust storms that coat equipment in fine particulates, seasonal droughts that undermine solar reliability, and temperatures exceeding 45°C—render conventional solutions inadequate. Most critically, the absence of electrified water pumping forces community members, primarily women and girls, to walk extensive daily distances for basic water access.

TOTAL ENERGY ISOLATION
Complete absence of grid infrastructure forces dependence on kerosene and diesel generators.

CRITICAL SERVICE GAPS
Lack of reliable power jeopardizes healthcare, education, and water access.

EXTREME HEAT
Ambient temperatures exceeding 45°C degrade conventional components and reduce solar efficiency.

DIESEL DEPENDENCY
Remote clinics/schools rely on expensive, unreliable fuel shipments consuming a large part of community budgets.

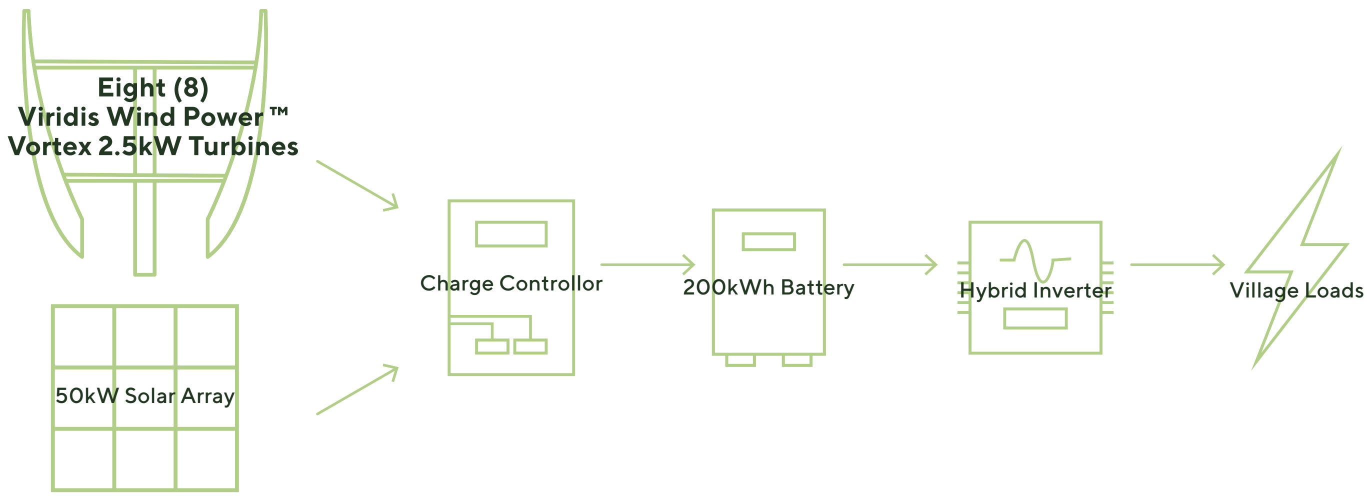
DUST DEGRADATION
Fine particulate infiltration compromises conventional energy equipment.

SEASONAL DROUGHTS
Drought conditions strain resources while increasing demand for irrigation and clean water.

SOLUTION

A community owned micro-grid using eight (8) Vortex 2.5kW Vertical Axis Wind Turbines + a 50kW solar array + 200 kWh battery storage. Turbines generate power day/night, especially during dry seasons when solar output drops.

A hybrid micro-grid featuring eight (8) Vortex 2.5kW turbines. Specially engineer resilience adaptations for desert conditions:



Desert Resilience Features

DUST RESILIENCE	**Sealed bearings** and **protective coatings** that actively combat Saharan dust infiltration
THERMAL HARDENING	**Extreme temperature tolerance** is achieved through **specialized resins applied to carbon fibre components**
DECENTRALIZED DESIGN	Modular turbines **installable without cranes or paved roads** and suited for **remote infrastructure constraints**
BACKUP BATTERY	Provides **backup power for critical loads** during outages

Key Outcomes

Creates the potential for electric water pumping for small scale irrigation enabling dry-season agriculture to **reduce food insecurity**.

Annual wind production reaches 148,800 kWh (18,600 kWh per VAWT)—a capacity factor of ~85%, and is complemented seasonally by ~75,000 - 90,000 kWh from solar (depending on location).

Displaced **kerosene/diesel expenditures free up capital** for local enterprises.

24/7 availability powers water purification, clinic refrigeration, evening education, and household needs.

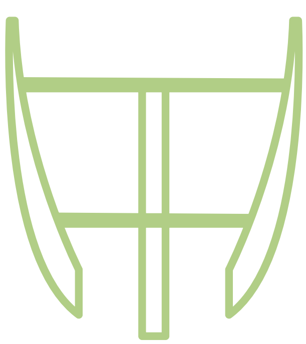
Clinic vaccine storage and reliable emergency nighttime lighting **improve community health resilience.**

Electrification of water pumps slashes women's daily walking distance by several kilometers— reclaiming hundreds of hours monthly for education, childcare, or livelihoods. **This addresses both gender equity and water security challenges.**

Local technicians manage operations via **embedded training programs, creating skilled jobs. Revenue from community enterprises stays within villages**, establishing a self-reinforcing **cycle of investment.**

TECHNICAL DIFFERENTIATION: ADVANTAGES IN ARID CLIMATES

WHY VIRIDIS WIND POWER ™ VAWTs ?



Output Consistency

Our **patented blade technology** produces high torque at low wind speeds **(5.5 km/h startup)**.

With no gearboxes or yaw systems our turbines **resist environmental stressors through simplified mechanics**.

Additionally, our turbines' ability to **capture turbulent, shifting winds without repositioning ensures consistent output** even during dust storms .

Hybrid Synergy

Viridis vertical axis wind turbines are not affected by daylight limitations, **generating substantial power overnight and during dry seasons—periods when solar output naturally declines** but demand for water pumping and cooling remains high. This makes VAWT+solar integration uniquely effective for African conditions, minimizing battery cycling and extending system lifespan.

Maintenance Advantage

The **modular design enables deployment without heavy machinery**, critical in remote regions.

Fewer moving parts reduce service requirements compared to diesel generators or horizontal turbines, while standardized components that are **ground accessible** (no crane requirements) **simplify repairs** by local technicians.

Why our Vortex 2.5kW VAWTs Prevail in a Desert Micro-grid Environment:

Versus Solar

Dust resilience: Our turbines generate power—even during dust storms that coat solar panels and slash output significantly—ensuring continuous water pumping and clinic operation.
Nighttime critical load coverage: Viridis VAWTs produce electricity after dark when villages rely on lighting and refrigeration – periods where solar contributes zero energy without prohibitively large batteries.
Dry-season reliability: During East Africa's extended dry seasons when solar output declines by 25-40%, our VAWTs generate peak output ensuring consistent power for irrigation pumps and clinics.
High recyclability: Our turbines' aluminum towers and composite blades exceed solar panel recyclability.

Versus HAWTs

Accessible maintenance: Ground-level generators in our turbines enable repairs by local technicians using basic tools – unlike HAWTs requiring crane access for nacelle failures.
Storm survivability: Our turbines maintain continuous operation during high wind gusts—avoiding the shutdowns that force HAWTs offline for safety when their pitch mechanisms disengage.
Near-silent community integration: Our turbines operate at near-inaudible sound levels (<35 dB at 15m), eliminating the disruptive blade "swish" of HAWTs that forces installations away from homes and clinics.

Diesel

Cost stability: Eliminates volatile fuel transport expenses converting unpredictable diesel costs into fixed community reinvestment.
Water protection: Zero fuel storage eliminates groundwater contamination risks near village wells —a critical safeguard in drought-prone regions where water sources are already stressed.
Significant reduction in noise pollution: Created during genertor operation can be disruptive to communities, wildlife, and sensitive environments.
Health-first operation: Eliminate constant generator exhaust near homes and clinics – removing a primary source of childhood asthma and respiratory disease.

Environmental Impact

1. EMISSIONS REDUCTION

Displacement of kerosene and diesel: The system eliminates indoor particulate pollution from household lighting and reduces generator emissions. A significant amount of CO_2 emissions and associated pollutants are removed from the local atmosphere.

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

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

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

5. ECOSYSTEM PROTECTION

Woodland preservation: Reduced wood/charcoal demand preserves local acacia woodlands and protects biodiversity corridors.

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