



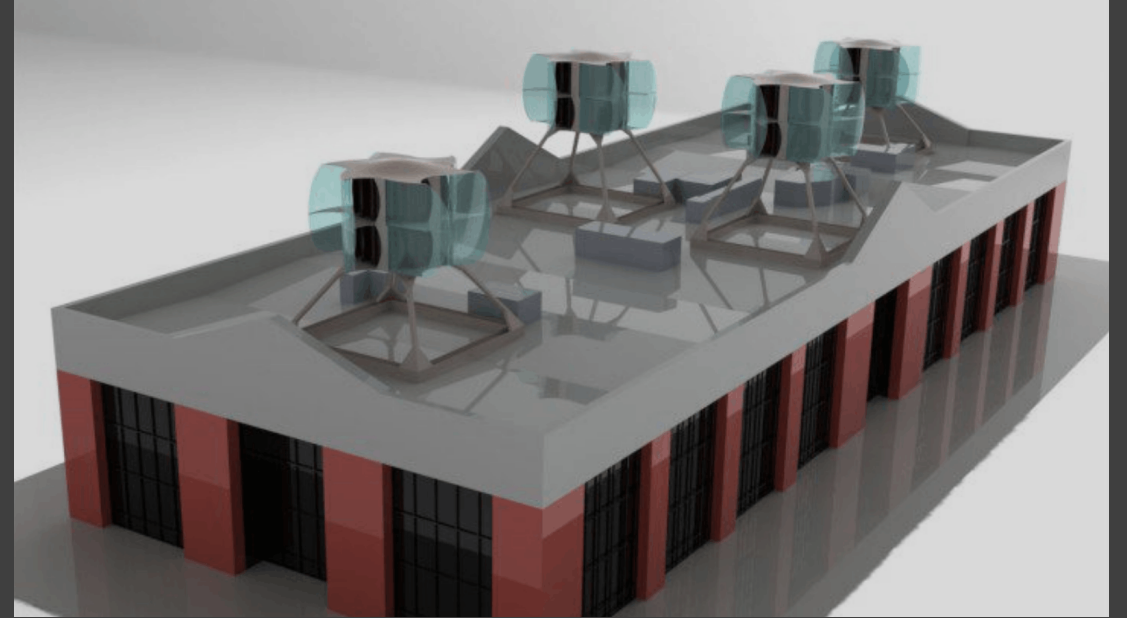
Empowering The World  
Through Innovation  
And Passion



# KOHILU

A woman in a red and white striped top and shorts stands in a grassy field at night, holding a glowing orb. To her right is a solar tower with three heliostats. The background is a starry night sky with the Milky Way visible. The Kohilo logo is in the top left.

**Kohilo goes beyond clean energy. We offer clean, stable, on demand, and constant energy which allows us to operate smart grids anywhere in the world.**

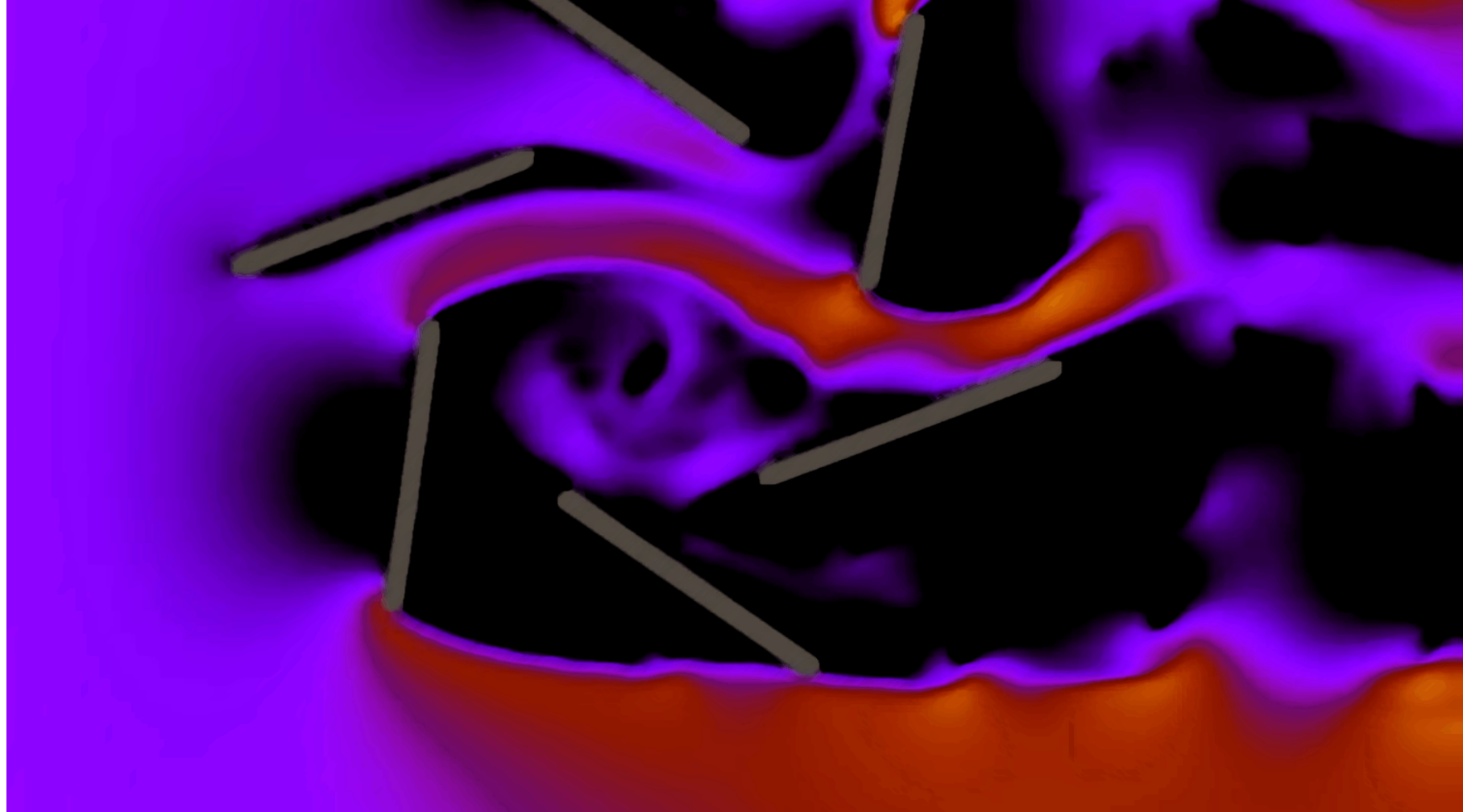


## **From Small Home Power To Utility Power**

- Adapting To Your Existing Infrastructure.
- To effectively build upon your current capabilities.



## Controlled Wind Flow



- Diffusers channel air flow directly into the internal blade system.
- Drag is eliminated and all potential energy is focused to the power stroke of the turbine.
- Controlled wind flow allows us to harness low altitude and turbulent wind.
- Diffusers create high velocity compression chambers and the Venturi effect from the tail wind helps to amplify velocity at the core.



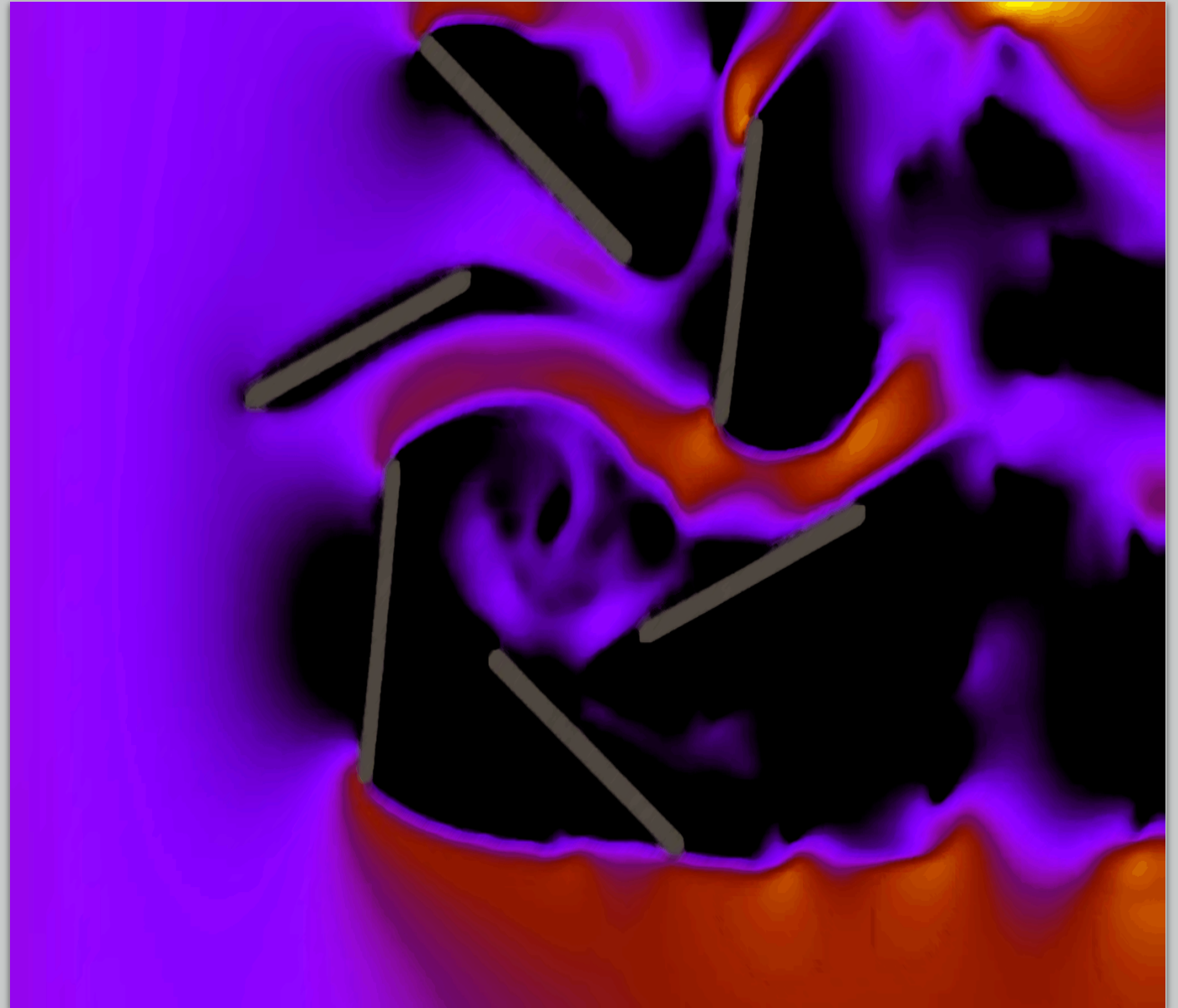
# Exoskeleton

- Rigid framing around the entire rotating turbine provides protection while allowing optimum bearing locations.
- Positioning bearings above and below the rotating turbine offers longterm reliability and high safety factor.
- Framing allows future system expandability, and mounting additional components.
- High safety factor due to the elimination of external rotating parts, making Kohilo one of the only bird friendly wind turbines.

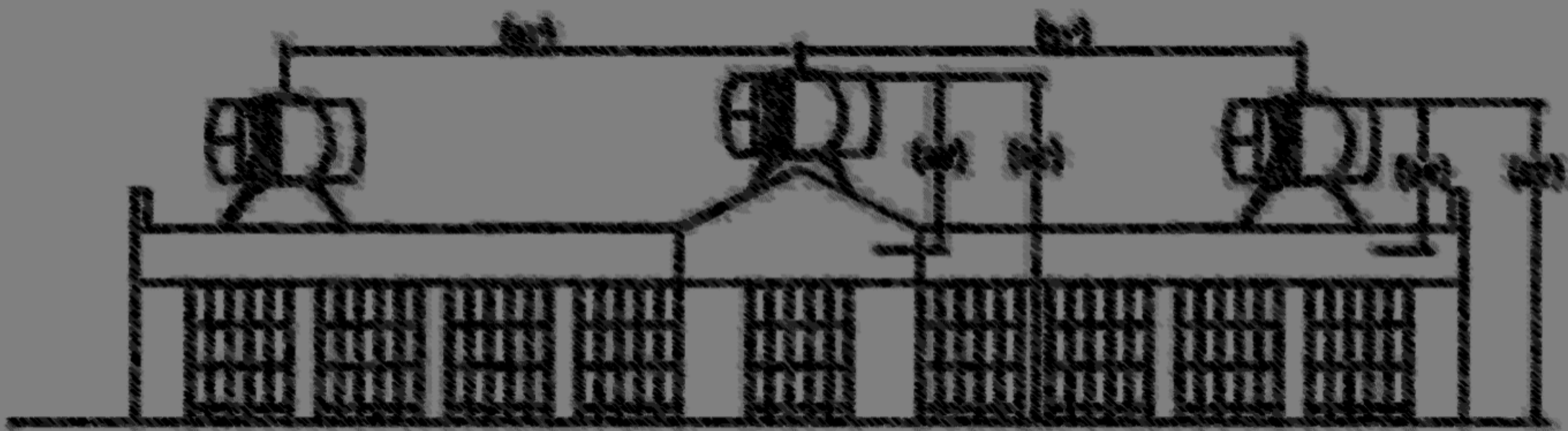


# Friction & Rotating Mass

- Magnetic bearing to offset rotating mass, gives zero thrust load on the main bearings.
- Reduces friction and noise while increasing longevity.
- Mass in motion consumes energy, excessive mass steals potential energy production from wind turbines.
- Rotating mass is reduced by reducing the size of the rotating mass and using light weight rigid framing.







## System Flexibility



Inverters programmed to deliver stored energy during peak demand to maximize savings.



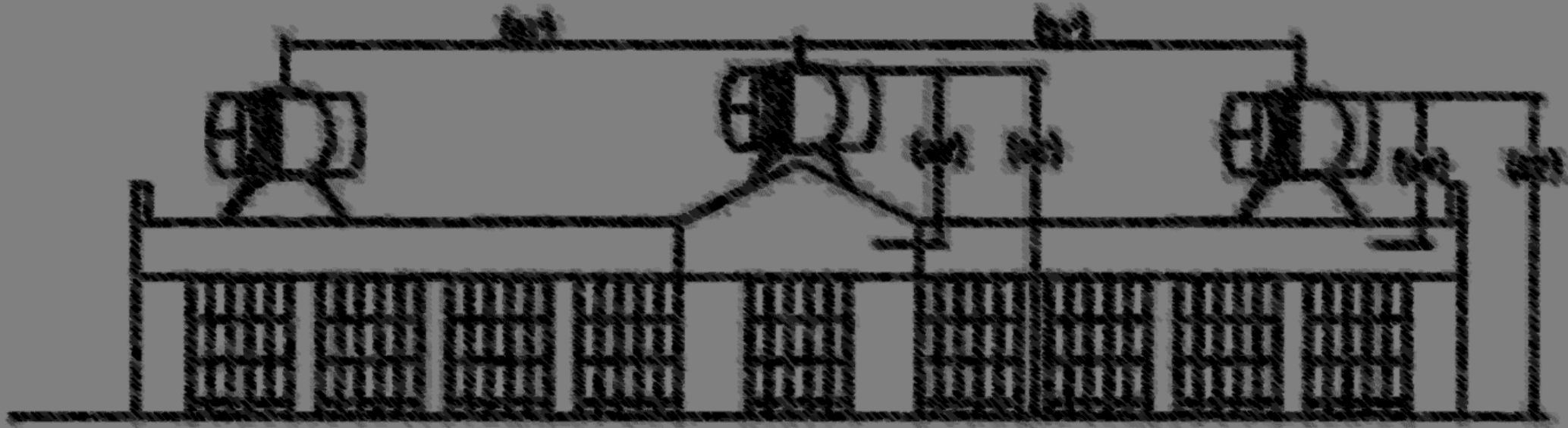
Battery storage is sized to work with real time power production to deliver power when needed.



During power surges, brownouts, and outages the system switches to stored energy as backup.



The system is programmable to adjust to many needs from power quality to time of power delivery.



## True Energy Independence

- Full off grid capabilities give true energy independence and security.
- Mobile Energy systems are also available for remote energy needs.
- Kohilo utilizes recyclable materials throughout the system construction to reduce the environmental impact.
- Energy packages are designed to fit any needs.



FARMS



HOMES



PARKS



MILITARY



GOVERNMENT



REMOTE POWER



BUSINESS







All Electronics Are Pre-Installed For Instant Use, Reduced Installation Requirements, And High Quality Control



Stationary Diffuser System Directs Wind Flow Perfectly Into The Turbine For Maximum Power



The Core Turbine Is The Only Moving Part Which Reduces System Fatigue And Increases Overall Safety

### Features and Benefits

- System fits into the base
- Safe and convenient shipping
- Enclosure is bullet proof
- Electronics are pre-installed
- Simple install reduces cost
- Deployment takes 2-8 hours
- DC and AC power
- Instant power
- Quick connect electrical
- Operates on or off grid
- Simple system expansion
- Remote WiFi monitoring

### Comes Complete With

- Base enclosure
- Tower
- All needed connections
- Hybrid inverter system
- Hybrid Energy Storage
- Wind Turbine
- Charge Controller
- Monitoring panel
- Convenience outlets
- Technical Support
- 3 year warranty

### Why Kohilo Quantum

- Powerful Plug And Play Energy
- Extreme Durability
- Silent Operation
- No Heat Signature
- Air Drop Ready
- Modular Design For Expansion
- Power Anywhere In The World
- Cutting Edge in Energy Production and Delivery
- Simple Solar Addition
- Reliable Power Anywhere You



R&D TO DEVELOPE THE ULTIMATE PERSONAL USB POWER SYSTEM



REMOTE COMMERCIAL LIGHTING AND REMOTE POWER



# Next Generation Mega-Watt Turbine



Cyclone MegaWatt System

- First wind turbine to offer constant power output no matter the wind speed “base load”.
- Hydraulic drive system for smooth, quiet, and efficient operation.
- Hydraulic power storage with controlled power delivery.
- Containerized power system at ground level for simple maintenance.

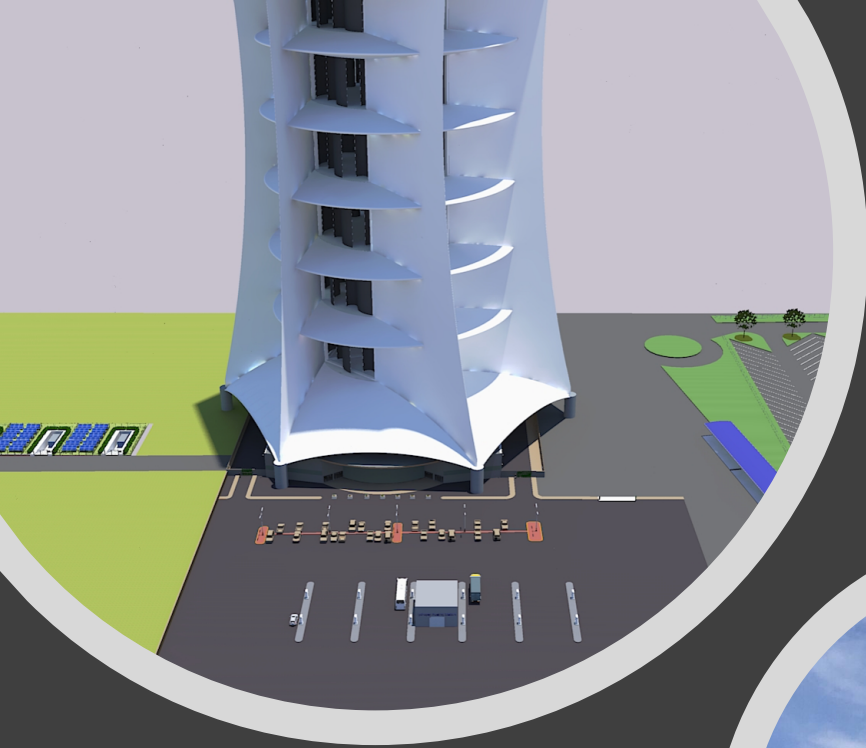


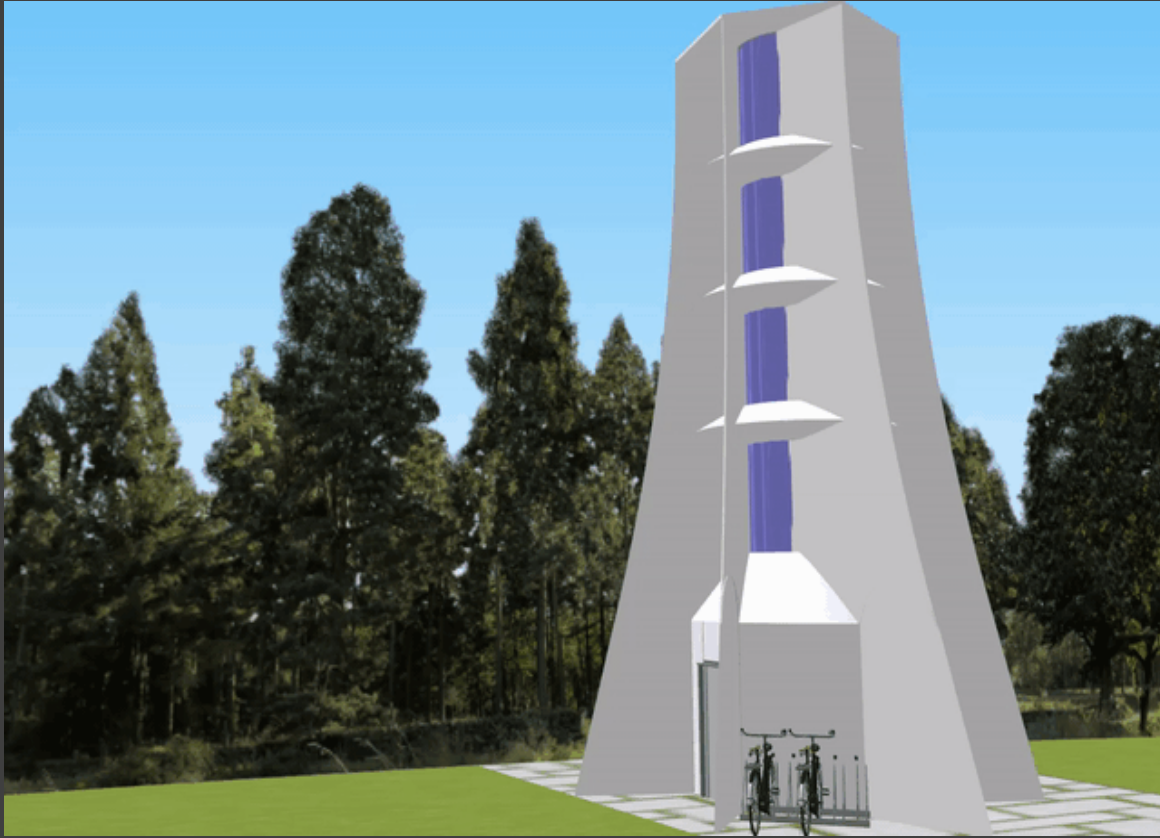




# LOADING STATION

- With the cyclone, we have a charging station for both electric and hydrogen vehicles to charge with green energy.
- This turbine can store the generated energy for up to 12 months in a hydraulic system.
- Thanks to this storage, the grid remains in balance and energy can be supplied when needed.





We also have a bicycle charging station for charging both electric and hydrogen bicycles, a system that can be placed in a natural environment.





Hydraulic Accumulator



Hydraulic Pump

## Hydraulic Accumulator Bank and Power System

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# Hydraulic Drive System

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Each stacked turbine is coupled to a variable piston hydraulic pump.

- This adjusts volume of the flow while maintaining pressure at varying wind speeds.

Each pump feeds an array of accumulators.

- This controls and stores potential energy without major loss.

The accumulator array flows to output manifolds.

- The manifolds utilize servo valves to control output flow.

The manifolds run hydraulic drives.

- The hydraulic drives connect to standard (synchro) generators.

The generators are set to run at optimum voltage, frequency, and output.

- The stored hydraulic energy is controlled through the drive to maintain the optimum rpm on the generator.

The controlled output is then fed to the transformer or inverter system.

- Due to the low variation in voltage, frequency, and output we can utilize off the shelf solar inverters or in some cases run directly to the transformer through phase synchronizers.



# ELEGANT DESIGN IMPLEMENTATION

- Tensile Fabric Offers Unique Designs  
Offering alternative diffuser designs helps our versatility in more aesthetically demanding locations.
- Basic System Design Is Maintained  
By maintaining basic design fundamentals, there's no effect on system performance.
- Added Value When Designed For Dual Use  
When utilizing elegant design aspects the structure can then be utilize as shelter for events or other uses that require shelter from weather.



## ABB megawatt station PVS800-MWS 1 MW



The ABB megawatt station is a turnkey solution designed for large-scale solar power generation. It houses all the electrical equipment that is needed to rapidly connect a photovoltaic (PV) power plant to a medium voltage (MV) electricity grid. All the components within the megawatt station are from ABB's product portfolio.

### Turnkey-solution for PV power plants

The ABB megawatt station design capitalizes on ABB's long experience in developing and manufacturing of secondary substations for utilities and major end-users worldwide in conventional power transmission installations.

A station houses two ABB central inverters, an optimized transformer, MV switchgear, monitoring system and solar generator terminal boxes. The station is used to connect a PV power plant to a MV electricity grid, easily and rapidly.

To meet the PV power plant's demanded capacity, several ABB megawatt stations can be combined.

### Compact design eases transportation

The steel-framed insulated container comes complete with a concrete foundation. Its thermal insulation enables operation in harsh temperature and humidity environments and is designed for at least 25 years of operation.

The hollow concrete foundation has a steel double floor within the inverter compartment. This provides easy access for cabling. Additionally the small inverter footprint makes the container easy to lift via a standard truck crane, thereby simplifying transportation.

The complete ABB megawatt station weighs only 20 tons. At 50 m<sup>3</sup>, the container's volume is some 15 percent smaller than equivalent available solutions.

### Highlights

- Proven technology and reliable components
- Compact and robust design
- High total efficiency
- Modular and serviceable system
- Double-stage air pre-filtering for reduced maintenance
- Global life cycle services and support

Power and productivity  
for a better world™



## ABB megawatt station

### Solar inverters

ABB solar inverters are the result of decades of industry experience and the use of proven frequency converter technology. As such the solar inverters provide a highly efficient and cost-effective way to convert the direct current, generated by solar modules, into high-quality and CO<sub>2</sub>-free alternating current. Two, 500 kW ABB central inverters are used in the ABB megawatt station. The inverters provide high efficiency conversion with low auxiliary power consumption.

### Transformer

The ABB megawatt station features an ABB vacuum cast coil dry-type transformer. The transformer is designed to meet the reliability, durability, and efficiency required in PV applications. It is specifically designed and optimized for ABB solar inverters to provide the best performance throughout the lifetime of the plant.

The transformer is environmentally safe, having no volatile liquids that can leak

and carries no fire or explosion risk. It provides excellent mechanical and short-circuit characteristics.

As a major global transformer manufacturer, ABB offers a wide range of liquid filled and dry-type transformers. Alternate power transformers are available to meet customer requirements. All ABB's transformers are manufactured in accordance with the most demanding industry and international standards.

### Switchgear

ABB offers a complete range of medium voltage switchgear for secondary distribution, including air insulated and gas insulated.

The ABB megawatt station is equipped, as standard, with the widely proven ABB SafeRing, SF<sub>6</sub>-insulated switchgear. A sealed steel tank with constant atmospheric conditions ensures a high level of reliability as well as personnel safety. The virtually maintenance-free system comes in a compact and flexible design that allows for a versatile

switchgear configuration. As an option ABB's gas-insulated SafePlus and air insulated Unisec switchgear are also available.



### Technical data and type

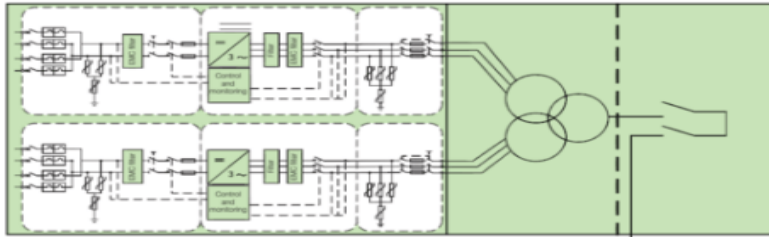
| Type code                                      | PVS800-MWS-1000kW-20<br>1 MW                                      |
|--|---|
| <b>Input (DC)</b>                              |   |
| Recommended max PV-power ( $P_{PV}$ )          | 2 x 600 kW  |
| Nominal DC power                               | 2 x 515 kW  |
| DC voltage range, mpp ( $U_{DC}$ )             | 450 to 750 V (- 825 V*)   |
| Maximum DC voltage ( $U_{max,DC}$ )            | 900 V (1000 V*)   |
| Maximum DC current ( $I_{max,DC}$ )            | 2 x 1145 A  |
| Voltage ripple, PV voltage ( $U_{PV}$ )        | < 3%  |
| Number of protected DC inputs (parallel)       | 2 x 4 (+/-) / 2 x 16 <sup>1)</sup>                                |
| Number of mppt trackers                        | 2   |
| <b>Output (AC)</b>                             |   |
| Nominal AC output power ( $P_{N,AC}$ )         | 1000 kW   |
| Nominal AC current ( $I_{N,AC}$ )              | 28.9 A  |
| Nominal output voltage ( $U_{N,AC}$ )          | 20 kV <sup>2)</sup>   |
| Output frequency                               | 50 / 60 Hz  |
| Harmonic distortion, current <sup>3)</sup>     | < 3%  |
| Power factor compensation (cosφ)               | Yes   |
| Transformer type <sup>4)</sup>                 | ABB Vacuum cast coil dry-type                                     |
| Medium voltage switchgear type <sup>5)</sup>   | ABB SafeRing type DeV with REJ603 protection relay (self-powered) |
| <b>Efficiency</b>                              |   |
| Maximum <sup>6)</sup> (including transformer)  | 97.4%   |
| Euro-eta <sup>6)</sup> (including transformer) | 96.9%   |

\* Max 1000 VDC input voltage as an option with mppt range 450 to 825 V. If DC is > 1000 VDC inverter is not damaged, but will not start

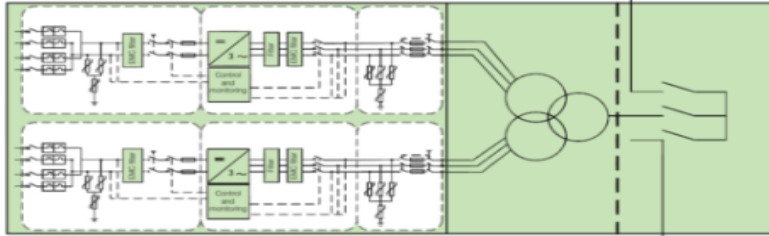


## ABB megawatt station design and grid connection

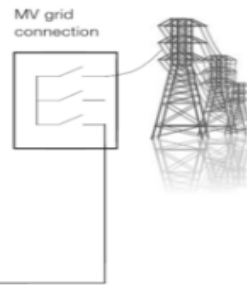
1: PVS800-MWS-1000kW-20



2: PVS800-MWS-1000kW-20



20 kV



20 kV

### Type code

**PVS800-MWS-1000kW-20**  
**1 MW**

### Power consumption

|   |               |
|---|---------------|
| Own consumption in operation <sup>7)</sup>  | < 1200 W      |
| Standby operation consumption <sup>7)</sup> | < 110 W       |
| External auxiliary voltage <sup>8)</sup>    | 230 V / 50 Hz |

### Dimensions and weight

|                            |                          |
|----------------------------|--------------------------|
| Width / Height / Depth, mm | W 6930 / H 2970 / D 2430 |
| Weight appr.               | 20 t                     |

### Environmental limits

|   |   |
|---|---|
| Degree of protection                              | IP54 (inverter) / IP23d (transformer and SWG) |
| Ambient temperature range (nominal ratings)       | -20 to +40 °C                                 |
| Maximum ambient temperature <sup>9)</sup>         | +50 °C  |
| Relative humidity, non condensing                 | 15 to 95%                                     |
| Maximum altitude (above sea level) <sup>10)</sup> | 2000 m  |
| Cooling air flow                                  | 7520 m <sup>3</sup> /h                        |

### User interface and communications

|                       |                            |
|-----------------------|----------------------------|
| Local user interface  | ABB local control panel    |
| Fieldbus connectivity | Modbus, PROFIBUS, Ethernet |

### Product compliance

|                 |   |
|-----------------|---|
| Safety and EMC  | CE conformity accordance to LV and EMC directives                                     |
| Grid compliance | According to country requirements   |
| Grid support    | Reactive power compensation, Power reduction, Low voltage ride through <sup>11)</sup> |

<sup>1)</sup> Optional MCB inputs, 80 A each

<sup>2)</sup> Voltages between 6 to 36 kV available as an option

<sup>3)</sup> At nominal power

<sup>4)</sup> Other ABB transformer types available as an option

<sup>5)</sup> Other ABB switchgear types available as an option

<sup>6)</sup> Efficiency without auxiliary power consumption, at  $U_{DC}$  450 V with standard transformer

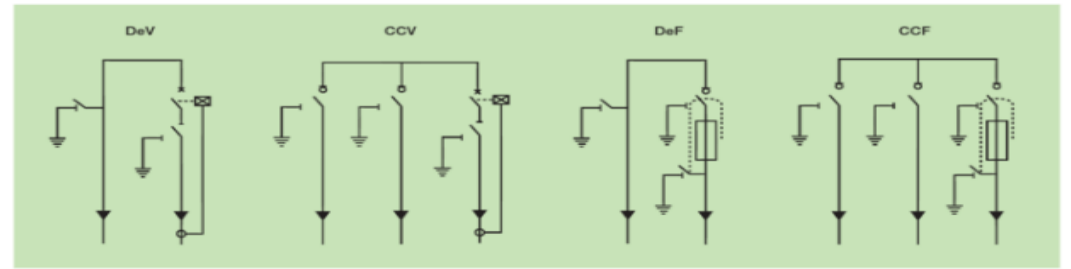
<sup>7)</sup> Without options

<sup>8)</sup> 115 V, 60 Hz optional

<sup>9)</sup> Power derating after 40 °C

<sup>10)</sup> Power derating above 1000 m. Above 2000 m special requirements.

<sup>11)</sup> Optional



### Accessories

- Solar array junction boxes with string monitoring
- Remote monitoring solutions
- Warranty extensions
- Solar inverter care contracts

### Options

- MV AC output voltages (6 to 36 kV)
- Different MV switchgear configurations
- Air-insulated MV switchgear
- Higher efficiency dry-type transformers
- Liquid filled transformers
- Integrated DC input extension cabinets in inverters
- Cabinet heating
- I/O extensions
- Extended voltage range, 1000 VDC max.
- DC grounding (negative and positive)
- Fieldbus and Ethernet connections

### Support and service

ABB supports its customers with a dedicated service network in more than 60 countries and provides a complete range of life cycle services from installation and commissioning to preventative maintenance, spare parts, repairs and recycling.

For more information contact your local ABB representative or visit:

[www.abb.com/solar](http://www.abb.com/solar)  
[www.abb.com](http://www.abb.com)

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# All Components Containerized

No specialized trucking/shipping needed.  
Ease of:

- Installation;
- Maintenance;
- System updates;
- Component replacement;
- System Expansion;
- Monitoring.





