



GREENFLOWENERGY

**Removing the Intermittency of Renewable Energy**

***The Generator Array***

***Green, Stable, Reliable, Consistent, Controllable,  
Scalable, On-Demand Electricity Generation.  
Anytime, Anywhere, Globally***



**Problem Statement** We are still increasing our use of fossil fuels for energy and transport.

## 1. Intermittency of Renewable Energy.

## 2. EV Range & Charging Anxiety.

### Problem 1

**Renewable Energies are abundant but NOT CONSISTENT or Reliable**

- Limited in availability.
- Limited control.
- Limited operation.
- Subject to weather changes
- Therefore unreliable.

### Problem 2

**Current mainstream energy storage methods**

- Are not Green.
- Emit high levels of C<sup>o</sup>2 during production.
- Have low lifecycle
- Have low energy storage capacity – Hours not days.
- Are Expensive.

### Problem 3

Current renewable solutions focus on large capacity HYDRO Electric Dams, Wind Turbines or Solar for Grid or off grid scale generation & operate with low-capacity factors +- 45%.

Multiple standby technologies are integrated for grid stability; these all support the grid but are increasing points of **FAILURE & COST.**

### Problem 4

**Decarbonisation of Transport.**

- Electric transportation uptake is slow.
- Range and charging infrastructure largely to blame.
- Charging times and charge-point availability.
- Rail, Shipping, Aviation difficult to decarbonise.

# The solution



Our Green energy generation system can be driven by all forms of renewable kinetic energies, or a combination of these such as Wind, Water, Tidal, Wave, Geothermal, Solar, etc.

When renewables are unavailable our system can also be driven by Green stored energy technologies such as compressed / liquid air, pumped hydro, thermal, gravity etc.

As such the system can provide 100% green energy, at scale, from 100% green energy sources, 100% of the time (Storage Capacity Dependant) **at any location, globally, on demand.**

This enables the below benefits, to mention a few,

- **Energy on demand**
- **Refined system controllability & management.**
- **Not dependent on weather.**
- **Lower capital costs.**
- **Higher operational efficiency.**
- **Increased energy output & system availability.**
- **Grid Inertia.**
- **Deployable anywhere globally at any scale to any industry.**

## Features

- Continuous Green Energy Generation.
- Refined Controllability of each generator in the system.
- Localised Stored Energy.
- Redundant units built into generator array.
- Continuous rotation of generator with renewable kinetic and stored energies.
- Smaller, lighter, modular system.
- Multiple source primary drivers.

## Benefits

- Reliability, Stability, & Security of Supply.
- Optimised efficiency and capacity factor. **Increased energy output.**
- Enables continued rotation of the generator array. **Increased, efficient & stable energy output.**
- Less downtime of system, scheduled maintenance. **Increase operation**
- More reliable, stable and secure energy generation. **Grid Inertia.**
- Lower transportation, reduced manufacture and installation costs. **Lower capex faster ROI.**
- Increased stability of supply & revenues. **Grid Inertia. Cost Reductions More profit.**



## Unique Novel Features of our system.

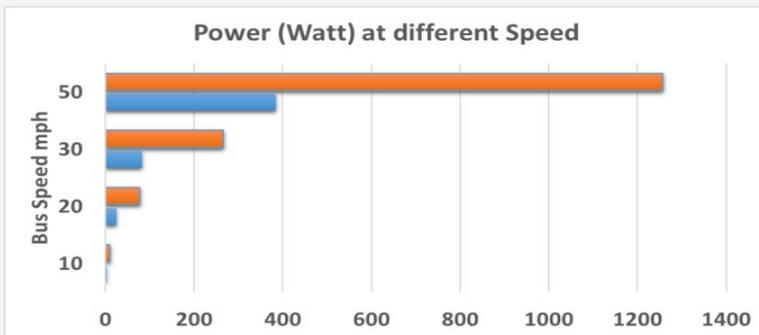
- Generator Array can electronically disconnect from Capture mechanism (Blades).
- Can be driven by any form of renewable, kinetic & locally stored energy technologies (compressed air etc)
- System can provide **energy on demand**.
- System is not reliant on availability of renewables.
- Highly Scalable and deployable to multiple applications & industries.
- Individual Generators can be mass produced, capacity increased by adding additional generators.
- Increased green energy generation controllability and output.
- Lower Weight, smaller footprint of system.
- Redundancy built into system for longer operation.
- Easier to Transport & Install.
- Overall lower CAPEX
- Faster ROI.
- Faster route to decarbonise electricity generation and negate use of fossil fuels.

# Core Technology Innovation

## TRANSPORT – Secondary Application FOAK

The following is an extract from a University research paper on the generator array deployed in an electric battery bus, the initial study demonstrated it is possible to extend the range of the bus on a stop/start suburban route (4 miles 2%) by capturing wasted kinetic energy (airflow) in a ducted system, the study proved there is a reduction in drag whilst the vehicle is in motion. The force of airflow in the ducting can drive the relevant number of generators within the array, supplying energy into the propulsion system and or the on-board batteries. With further refinement it is estimated the range of an electric vehicle could be increased by 50%+ depending on the vehicle design, mode of transport and average speed. Applied to a long travel coach or HGV at 1.5kw per mile consumption at 50 MPH, 1.2kw could be generated with only 300w being used per mile from batteries or an **80% range increase**. *Full report is available on request.*

Bus Speed in mph and m/s	Duct inlet speed m/s	Duct outlet speed m/s	Drag Coefficient
10 mph (or, 4.47 m/s)	1.628	6.438	0.605
20 mph (or, 8.94 m/s)	3.271	13.063	0.594
30 mph (or, 13.41 m/s)	4.916	19.739	0.588
50 mph (or, 22.35 m/s)	8.209	33.161	0.53



Captured power to drive the generator array at different speeds with (red) and without the duct (blue)

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Proof of Concept

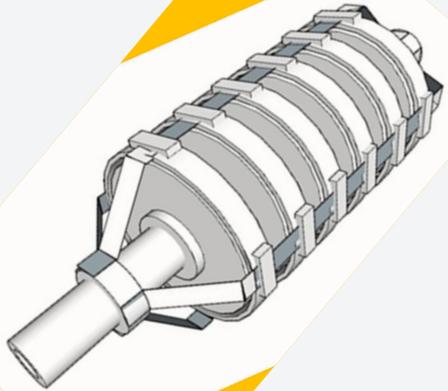


## Wind Turbine MAIN APPLICATION

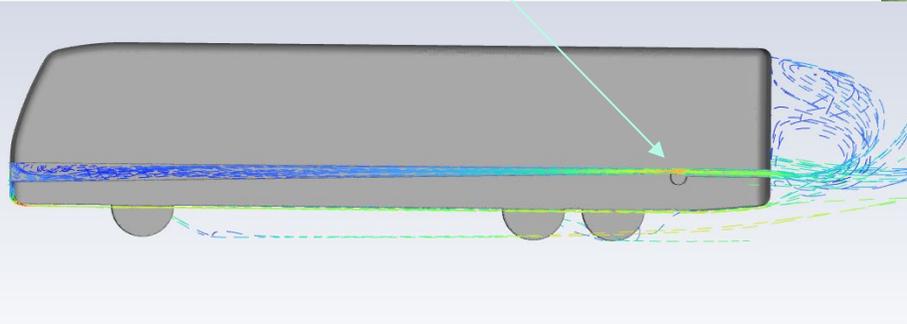
Comparison of single generator vs Array	Siemens 2.3MW	Generator Array Configuration With commercial drives
Start-up Wind Speed	3-5 m/s	1m/s
Generator Name plate Capacity	2.3MW	380 Kw
Number of generators to match nameplate capacity	1 = 2.3MW	14= 2.380 Mw
Number of generators to match recorded Torque of installed Siemens 2.3Mw Wind Turbine	1 = 2.3MW	30 = 11.4 Mw Peak power 30 = 5.4Mw Continuous power
Peak operational Wind Speed	14 m/s 50% Efficiency	12 m/s 96% Efficiency
Operational during periods of no Wind	No	Yes
Continuation of energy generation with stored energy technologies	No, energy production subject to wind availability with max 45% capacity factor	Yes, provides continuous energy supply when combined with stored energy.



# How it works



Generator Array in electric bus – Actual Size

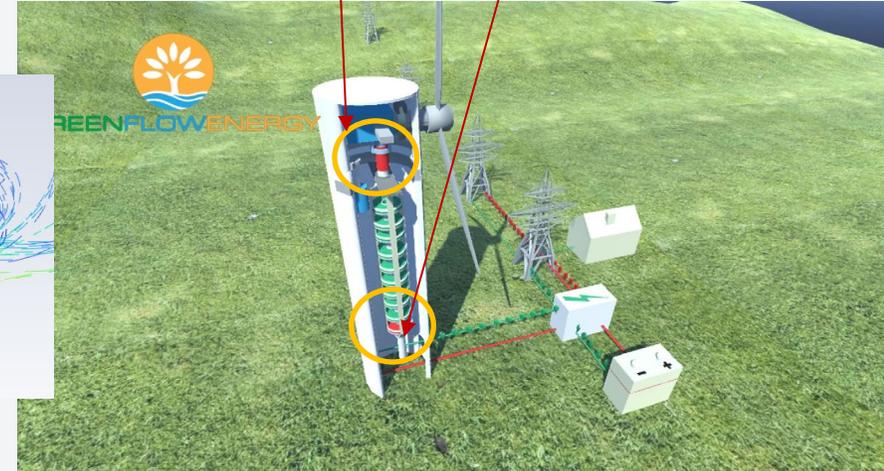


The system is easily scalable to capacity by adding more drives. Redundancy can be built in for drive failure and scheduled repair. Easier to transport, lighter and lower capex.

The Array can be deployed within a myriad of applications and all modes of transportation without aerodynamic impact.

Electromagnetic Coupler

Stored energy drive



## Continuous Energy Supply

The system can be driven by any renewable kinetic energy sources when available. Alternatively, the array can disconnect from the capture mechanism and be driven by localised stored energy technologies.

## Core Technology

The Generator Array consists of several individual drives that are connected via a series of rigid ties, all rotors spin in unison, individual stators are controlled to match available torque derived from external kinetic energies capture mechanism (Blades). Resulting in energy generation at higher efficiency and capacity optimisation.

# Transportation Benefits – Range Extending

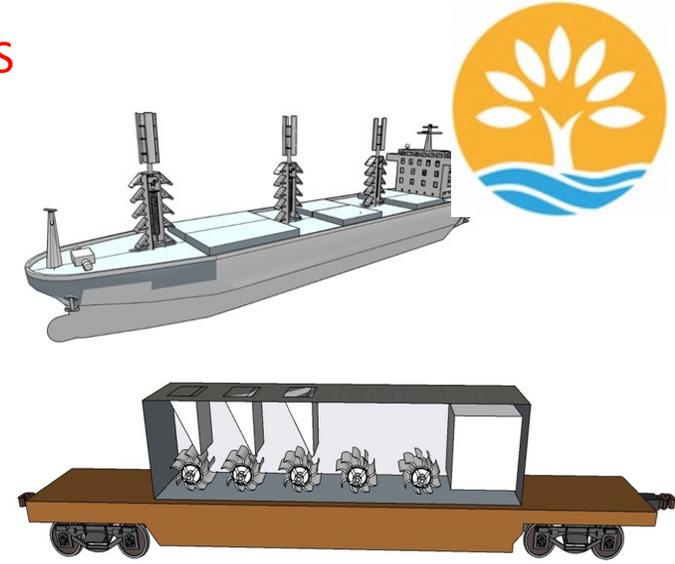
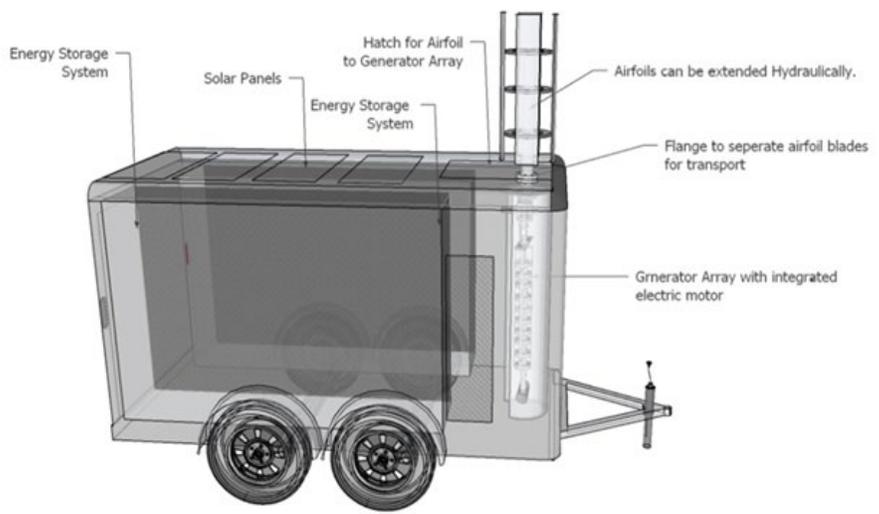
- On-board, In vehicle power generation.
- Self-charging fully electric vehicles.
- Extended Range from on-board stored energy.
- Reduction of stored energy capacity and weight.
- Less connection to grid for recharge, if any.
- Reduction of grid-based energy supply.
- Reduction of charging infrastructure.
- Reduction in weight of vehicle.
- More rapid decarbonization of transportation industries.
- Less mining C°2 of intensive raw materials.
- Scalable & deployable to any mode of transportation.
- V2X energy transfer.

## UNIVERSITY VALIDATED

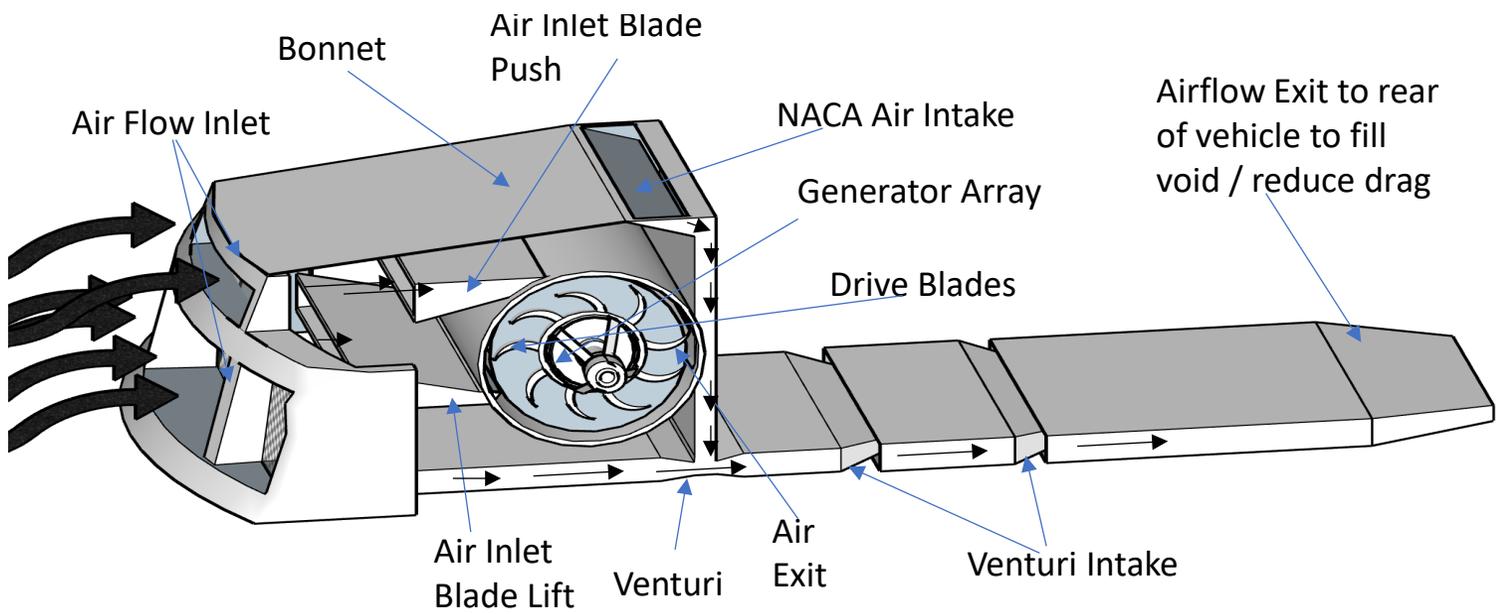
Simulation resulted in 2-70% range increase depending on average speed.

**Average EV consumption – 250w p/m = 4 miles per kw**  
**Estimated 300-450w generation per mile for average passenger EV consumption equilibrium**

## CONCEPT DESIGNS



NOT TO SCALE





## Milestones

- Patent - GB25433955 – UK, USA, Europe, India, China, Japan – **Wind Turbines Etc**
- Patent - GB2621548 – UK, USA, Europe, India – **Transport**

## Technology Assessment Grants & Research Organisations

- £15k Innovate UK – Warwick Manufacturing Group – Wind Turbines
- £10k Scottish Inward Investment, via Interface – Glasgow Caledonia University - Transport

Proof of Concept system built – Self built by founder using commercially available components.

**COLLABORATION DEVELOPMENT ORGAISATIONS INDENTIFIED & WILLING TO PARTNER SUBJECT TO FUNDING**



Innovate  
UK

Business  
Connect



Interface



Barker Brettell  
Intellectual Property

## Total Addressable Market – TAM

- **Grid-** The market was valued at \$941.16 billion in 2023 and is expected to more than double to over \$2 trillion by 2032, with a compound annual growth rate (CAGR) of approximately 8.4%.
- **Off Grid-** The global off-grid energy generation market, primarily driven by off-grid solar, valued at approximately \$2.45 billion in 2023, projected growth to \$6.8 billion by 2032.
- **Leisure / Portable-** The market size is estimated to be in the range of USD 2.74 billion to USD 5.38 billion for 2024, with different reports providing varying figures.
- **Transport**
  - **Road-** The global road vehicle market is a large and complex sector, valued at roughly \$4,360 billion in 2024 and projected to reach about \$6,678 billion by 2032. Includes passenger cars and commercial vehicles. The rapid growth in electric car sales over the past 5 years has had a significant impact on the global car fleet: **At the end of 2024, the electric car fleet had reached almost 58 million units, about 4% of the total passenger car fleet and more than triple the total electric car fleet in 2021.**
  - **Rail-** The global locomotive market is experiencing robust growth, driven by significant investments in a shift towards electric and hybrid locomotives for environmental reasons, and increased demand for both freight and passenger transport. Forecasts suggest it could exceed USD 40 billion by 2030, driven by advancements in technology like autonomous trains.
  - **Maritime-** The global maritime drivetrain solution market was valued at approximately USD 12.3 billion in 2023 and is projected to reach USD 18.4 billion by 2032, with a CAGR of 4.6%.
  - **Aviation -** The global aviation drivetrain market, largely encompassed by the aircraft engine market, is experiencing growth driven by increased air travel and military spending, projected to grow significantly over the next decade, potentially reaching over \$157 billion by 2032. Key trends include a focus on electric and hybrid drivetrains, the advancement of turbofan technology.



## Serviceable Available Market – SAM

- Grid-
- Off Grid-
- Leisure-
- Transport
  - **Road-**Motor vehicles (cars, buses, trucks, vans): In 2024, worldwide motor vehicle production surpassed 92.5 million units.
  - **Rail-** Units unknown but \$70bn
  - **Maritime-** 4500 units in 2024
  - **Aviation -** 2000 units in 2024

The global automotive regenerative braking system market size was estimated at USD 7.83 billion in 2024 and is projected to reach USD 15.18 billion by 2030, growing at a CAGR of 12.1% from 2025 to 2030. The rapid growth of the electric vehicle (EV) powertrain market is currently USD 300 billion.

## Serviceable Obtainable Market – SOM

- Grid-
- Off Grid-
- Leisure-
- Transport
  - Road-
  - Rail-
  - Maritime-
  - Aviation-

No current figures available as this is a new disruptive, breakthrough technology. Estimates are based on available data in the SAM markets, complementing re-gen braking markets, and other potential global markets with a conservative capture of 25% over 5 years. USD 156 billion.

**Global electric motor & generator market is currently US\$200 billion**

# Key Objectives



## Short term (3-12 Months): Seed Funding £500k-£3m

- **Form collaboration agreement / development partnership to further develop the technology.**
- Secure initial financial investment to develop professionally engineered working presentation prototype at scale.
- Develop Power control and monitoring system.
- Field testing validation, data logging and results analysis.
- Build core team.
- Exposure to the market via industry news channels Web, media, innovation shows and exhibitions.

## Medium term (next 1 – 3 years): Series A £10-£25M

- Obtain further investment funding.
- Develop a commercially available product for the transportation energy generation market.
- Establish global regional engineering and distribution partnerships.
- Develop technology for use in alternative applications i.e. wind, hydro, and other industries (GB Patent approved with PCT recently approved)
- Develop off grid, remote generation / charging system to bring electric transport as mainstream solution.

## Long term (3 – 5 years and beyond): IPO Offering

- Launch developed medium scale, multi-Megawatt capacity within 3 years for residential, commercial and off grid.
- Launch developed Large grid scale Multi Megawatt (5-15Mw+) capacity within 5 years for Grid, Maritime, Aviation etc
- Evolve technology for use in all major modes of transportation.

# Thank You



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**Greenest method of energy generation at any scale, industry and location.**