

Results of Competition: Energy Catalyst Round 7: Mid Stage

Competition Code: 1906_DFID_CRD_CGI_ENCAT_R7_MID

Total available funding is £32 million across early, mid and late strands

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
REFGAS LIMITED	Development of a small-scale multi-fuelled gasification system in Malawi	£1,053,338	£737,337
CAMBRIAN GAS LIMITED		£150,826	£105,578
Renew'N'Able Malawi		£142,474	£142,474

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Project description - provided by applicants

Malawi is faced with serious energy supply challenges and inadequate energy supply is limiting its social, economic and industrial development. Future economic growth crucially depends on the long-term availability of energy from sources that are affordable, accessible, secure and environmentally friendly (low carbon energy). The market for efficient energy solutions in Malawi is growing steadily but numerous reasons such as lack of capital, infrastructure, poverty and skills is severely hampering adoption.

The project consortium led by Refgas Limited in collaboration with Cambrian Gas Limited (t/a CamGas) and Renew'N'Able Malawi (RENAMA), aim to develop a modular and mobile biomass gasification and gas compression system to enable a low cost, on-site closed-loop process, that generates heat & electricity from a sustainable waste biomass feedstock and a pure syngas that can be compressed and bottled to supply affordable bottled gas for household applications (mainly cookstoves).

The project outcome will be a small-scale (250kW) prototype gasification unit that will be trialled in Dwangwa, Malawi. The partners will prove that the modular and mobile system is able to provide a reliable and affordable source of electricity and bottled gas from a sustainable biomass feedstock taken from local plantations (sugar cane waste), and will investigate new business models that will support deployment in rural areas across Malawi, with potential replication opportunities across sub-Saharan Africa and other developing countries globally.

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POWER ROLL LIMITED	CORES – Collaboration to Optimise Renewable Energy Systems: Introducing affordable, reliable, portable energy solutions to remote communities in India and Africa.	£735,207	£514,645
THE ENERGY AND RESOURCES INSTITUTE		£189,106	£189,106
VERO GRID LTD		£181,141	£126,799

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Power Roll Ltd (PRL), is an innovator in the solar power renewable energies sector, applying to lead a partnership to develop, test and implement innovative solar mini grid systems in two locations: sub-Saharan Africa and the Indian Himalayas. We are developing disruptive solar energy generation and energy storage technologies, based on our unique, patented breakthrough microgroove architecture, which allows us to exploit well established, roll-to-roll (R2R) manufacturing processes, enabling a transformational, low cost manufacturing process for affordable energy generation products. This 24-month project will allow PRL to work in India and Africa with our partners The Energy and Resources Institute (TERI) and VeroGrid (UK & Africa), as well as our experienced sub-contractors, to develop and demonstrate a unique, easy to use energy generation, storage and supply solution. The aim is to improve the lives of people living in rural communities by providing secure access to affordable electricity and assess social inclusion and gender equality benefits to local communities. The target locations Mukteshwar, India, and Mumbachala, Ngabwe District, Zambia share similar hardships borne out of harsh climates and levels of development in comparison to the rest of the world, but different continents and cultures. These factors underpin the challenge to develop a reliable power supply that is portable, low-cost, scalable, and sustainable. This is a unique opportunity to draw on the knowledge and expertise of key partners and sub-contractors to deploy innovative renewable energy solutions that meet the needs of diverse communities and positively impact the scope of efficiencies of daily tasks, quality of life, economic capabilities and social mobility. Although the solar mini-grid sector is at an embryonic stage developmentally in the Global South, it holds great potential for rural off-grid and weak-grid communities in sub-Saharan Africa and South Asia, which might enable them to contribute to achieving the requirements of national action plans. Power Roll is working in partnership with highly experienced organisations, forming a Collaboration to Optimise Renewable Energy Systems (CORES) aims to embed affordable solar power generation and storage solutions to support food security and nutrition, regenerative agriculture, access to water and development of holistic ecosystems. Renewable energy coupled with organic agricultural practice or energy efficient cooling systems can be the answer to lowering carbon emissions and improving the shelf-life of perishable foods. Such impact will be felt amongst local governing agencies, smallholder farmers, fishers, market traders and families.

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M-SOLV LTD	USPV Ultrasealing for Photovoltaics	£285,095	£142,548
DYCOTEC MATERIALS LTD		£387,828	£271,480
Nelson Mandela University		£79,486	£79,486
NPL MANAGEMENT LIMITED		£150,796	£150,796
OXFORD PHOTOVOLTAICS LIMITED		£35,130	£10,539

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SMART VILLAGES RESEARCH GROUP LTD	Integrated Minigrid + Integral Anchor Load Model for Rural Energy Access in Uganda	£326,637	£228,646
Ecolife foods Uganda		£156,924	£109,847
Kiima Foods Uganda NGO		£206,526	£206,526

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CONNECTED ENERGY TECHNOLOGIES LTD	Smart Biogas II - Increasing Wealth from Waste	£421,757	£295,230
Biogas Solutions Uganda		£51,861	£51,861
Hivos- Kenya Biogas Program		£52,591	£52,591
University of Nottingham		£49,965	£49,965

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Project description - provided by applicants

Smart Biogas is an Internet of Things (IoT) platform monitoring numerous geographically dispersed household/institutional biogas digesters at minimal cost. Smart Biogas collects data on individual biogas digesters' functionality, allowing detection of potential faults or substandard installation/operation. This data is transmitted to a cloud platform where it facilitates prompt repairs or further user training. Hardware and software was designed and successfully prototyped with Energy Catalyst Round 4 funding (No.132479). Further market research, user testing and feedback has key enhancements that would enable the biogas companies to scale their operations more rapidly and access currently unreached markets. The additional features including pay-as-you-go functionality, enhanced analytics and carbon offset verification, seek to address financial barriers and operational inefficiencies enabling viable biogas-as-a-service commercial models, enhancing company operations and providing additional income streams. Smart Biogas provides a powerful tool that facilitates increased access to biogas technology for more people, especially the rural poor. The project is led by Connected Energy Technologies, with support from prominent actors in the biogas sector in East Africa, Kenya Biogas Program and Biogas Solutions Uganda, along with technical input from the University of Nottingham.

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QUBE RENEWABLES LIMITED	AF4ENERGY Affordable Energy for Africa - Renewable Energy and Valorisation of Waste Biomass	£530,284	£371,199
Grants Ltd		£276,051	£193,236
University of South Wales		£344,089	£275,271

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Project description - provided by applicants

Agricultural waste in sub-Saharan Africa has significant untapped potential for biogas production. Biogas technologies are being applied to the conversion of some of these wastes into clean renewable energy, but to date this has relied largely on first generation 'wet' anaerobic digestion (AD) systems with high capital and operational costs and high parasitic energy loads.

In this project, a consortium of leading experts outline to introduce innovative and efficient sequencing batch 'dry' AD system enabled by robust ancillary monitoring systems that will optimise the AD process. This will be supported in county with increased analytical capacity building that will support this project and the wider AD sector, addressing one of the key failure points for AD systems - lack of technical support.

This will provide a route to clean affordable energy in rural sub-Saharan Africa by utilising high dry matter and high cellulose wastes.

This novel approach is systematically designed to overcome the key barriers to adoption and sustainability of energy from waste fed AD systems; capital cost, complexity, operational cost and local capacity. The AD system will be designed as a flat pack system to be built in Kenya using local components for final installation. In the commercial phase this enables rapid roll out of the technology whilst the project developers ensure quality of build and IP.

The business model looks to provide value to wastes through heat and power generation, selling these services to the agro processing sector, that are coming under increasing legislation in terms of waste control whilst having intermittent power supply. Excess biogas will be dried and compressed and used in local communities for cooking, lighting and cooling. Digestate will be processed to a compost and reused back in agriculture.

The respective innovations will help to overcome the energy trilemma whilst providing commercial ecosystems services to business and communities.

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MODULARITY GRID LTD	Development of a prototype hybrid minigrid system: Integrating innovative biomass, PV, decentralised lithium battery storage and cloud-based AI monitoring platform to provide 24-hour off-grid, clean electricity.	£590,711	£413,498
BRILL POWER LIMITED		£130,553	£91,387
Mandulis Energy (Uganda)		£522,962	£366,073
Waterloo Institute for Sustainable Energy, University of Waterloo		£237,586	£237,586

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N/A

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SOLAPAK DEVELOPMENT LIMITED	Demand Side Renewables for Agricultural Base Load Energy (DeSiRABLE)	£487,846	£341,492
GB-SOL LIMITED		£71,978	£50,385
Great Lakes Energy LTD		£66,295	£46,406
Heifer Project International		£79,559	£79,559
Trade Without Borders		£123,209	£86,246
University of Southampton		£233,794	£233,794

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TIWAKIKI CONSULTING LIMITED	ISABET: Integrated Solar And BioEnergy Technology for electricity supply in Nigeria.	£162,300	£113,610
CENTROTECH LIMITED		£193,650	£135,555
Neo Mundo Ltd. Nigeria		£113,355	£79,348
University College London		£146,796	£146,796

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Project description - provided by applicants

In this project, we will integrate of 2 well-established technologies (solar photovoltaic power and biomethane from biodigestion of waste biomass) to create a 24 hours all-weather electricity supply microgrid that will tackle the colossal lack of access to energy in Nigeria. Also, we will conduct a market analysis and develop a business plan for the viable and affordable deployment of the project outcome and for future scale-up beyond the project.

With an average of <6hrs/day of electricity supply in Amosun village (same across Nigeria), our contribution to increasing the supply of electricity means that domestic and commercial consumers can save an estimated \$14 billion/year used to power 14 GW of small-scale diesel and petrol generating sets. Furthermore, our waste-to-energy anaerobic digestion system will help to process food and agricultural waste that will otherwise pollute the environment, into clean renewable energy (24hrs) for >10,000 traders and residence.

By performing initial socio-economic appraisal, we will assess the affordability of potential end-users and the viability of the ISABET energy platform. We will leverage on the intrinsic waste-to-energy approach of the ISABET system to match the affordability of Nigerians. The implementation of a smart microgrid allows us to accurately measure loading and generation capacity of ISABET and to effectively plan for expansion into neighbouring communities. We will engage with local and national stakeholders to ensure buy-in and share outcomes from the project to improve energy policy in Nigeria.

The use of biomethane as an alternative to gasoil is expected to improve local air quality, with regards to NOx and particulate matter. We will reduce Nigeria's dependence on highly polluting diesel and petrol powered electricity generators. By generating electricity with solar power instead of fossil fuels, we can dramatically reduce greenhouse gas emissions, particularly carbon dioxide (CO2).

Our stakeholders and community engagement (workshops, social media, and flyers) will increase environmental awareness and prompt end-users to be more resource efficient in other parts of their daily life. Reliable electricity supply from the ISABET system will improved street and community lighting which will enhance security in Amosun village. By increasing the productivity and profitability, traders and residence (particularly women) will be able to improve the quality and quantity of food in the homes with positive impact on the general health and well-being of people.

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IPEC LIMITED	Link Box Monitoring	£216,842	£151,789
Pacific Power Technology Co Ltd		£16,562	£11,593

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Project description - provided by applicants

To develop a system that can detect defects in High Voltage (HV) underground cables and associated accessories in order that maintenance can be carried out before the cable or accessory failure occurs.

The system will monitor industry standard parameters of asset condition but with innovative application of new technology will allow condition monitoring of assets which previously either could not be monitored or not cost effective.

One of primary conditional indicators to be monitored is partial discharge (PD) that occur at defects in the insulation systems. These PDs create tiny current and voltage pulses that can be picked up at distances of up to four kilometres by highly sensitive PD sensors. The developed technology will allow these signals to be located in order that preventative maintenance can be carried out in a timely manner.

Additionally, the system will monitor various other parameters of the HV cable such as sheath voltage, leakage current and voltage spikes which all aid in the assessment of asset condition.

By combining the various parameters, trending of data and proactively repairing assets, the system will reduce the occurrences of power failures in High Voltage networks and improve the performance of regional and national power networks which communities in developing countries rely on.

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FRONTIER TECHNICAL LTD	MARLIN STAR Community Access to Stored and Transferrable Energy from Floating Renewables	£210,340	£50,570
Durham University		£64,999	£51,999
FRANCIS BROWN LIMITED		£424,387	£254,632
OFFSHORE RENEWABLE ENERGY CATAPULT		£59,100	£59,100
PLYMOUTH MARINE LABORATORY		£85,000	£85,000
TENSION TECHNOLOGY INTERNATIONAL LIMITED		£340,488	£238,342
The City of Sunderland Council		£197,950	£197,950
the energy and resources institute		£10,008	£10,008

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Project description - provided by applicants

The MARLIN STAR project is the next phase in the development and commercialisation of an innovation that will enable coastal community access to stored and transferable energy from floating renewables. It supports several of the UN Global Goals for Sustainable Development and particularly #7 'Affordable and Clean Energy'. It will revolutionise traditional construction techniques for building large floating platforms. The MARLIN underwater construction system employs patent protected buoyancy and orientation control. It enables structures consisting of uniform sized hexagonal interlocking modules to be constructed at the point of use. Float Modules fit into standard ISO shipping containers for easy transport to any location. Mass manufacture techniques and assembly without the need for large port infrastructure or large floating cranes will reduce costs. Realistic energy access will bring significant improvements to quality of life in the most deprived areas. The MARLIN STAR project assesses the market and social conditions for implementation of floating offshore wind energy generation, storage and transfer in Bangladesh and India. A socio-technical approach will be used to inform the design, to optimise the longevity of future installations, and to enable local operation and maintenance by the communities independently. Numerical analysis and laboratory tests will be conducted at internationally recognised research facilities. A prototype floating energy platform with a functioning wind turbine, energy storage, and innovative synthetic mooring and anchoring system will be built. Operational testing will be carried out initially in protected docks and then in the open sea.

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THE BIOFACTORY LTD	BioFactory - Low-cost, sustainable biogas production, through self-contained, off-grid latrine/waste-processing systems	£604,344	£423,041
ADEL Sofala		£65,650	£65,650
Southern African Resources Centre		£28,130	£28,130
University of the West of England		£158,287	£158,287

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P.A.K. ENGINEERING LIMITED	PCM Cooling Storage for Building Applications in Developing Countries (PCM-CoolStore)	£194,568	£136,198
ENVIRONMENTAL PROCESS SYSTEMS LTD.		£175,999	£123,199
RUBITEC LIMITED		£95,999	£67,199
Sokoto Energy Research Centre Usmanu Danfodiyo University Sokoto Nigeria		£35,000	£35,000
SOLAR READY LIMITED		£163,001	£114,101
University of Nottingham		£234,455	£234,455

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MOBILE POWER LTD	Innovation in Battery Storage for multiple uses in Sierra Leone	£408,392	£285,874
Brighter Horizons Project.DK		£23,740	£23,740
University of Sheffield		£149,849	£149,849
WINCH ENERGY LIMITED		£41,541	£24,925

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SCIENCE TECHNOLOGY AND INNOVATION FOR DEVELOPMENT LTD	Sustainable PV Minigrids as an Alternative to Grid Extension in Lesotho	£182,050	£127,435
Gram Oorja Solutions Private Limited		£69,076	£48,353
Mos-Sun Clean Energy Technologies (PTY) Ltd		£403,747	£282,623
National University of Lesotho		£38,155	£38,155

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BRITS ENERGY LIMITED	SolarTurbo-CHP, Semi-renewable, grid independent micro combined heat and power system	£298,086	£208,660
Cranfield University		£48,219	£48,219
LEMS Energy Management Pty Ltd		£68,497	£47,948
SAMAD POWER LTD		£590,060	£413,042
University of Birmingham		£47,485	£47,485
University of Pretoria		£233,500	£233,500

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STRAW INNOVATIONS LTD	Enhanced Rice Straw Biogas	£612,997	£429,098
Aston University		£147,333	£147,333
University of the Philippines Los Banos		£115,309	£115,309

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Rice straw is the third largest biomass resource in the world, after sugar cane bagasse and maize stover. Unlike rice husks (that cover the grain and are taken to rice mills), rice straw gets left in the field after harvest and few major uses have been identified for it, so across Asia more than 300 million tonnes of it are simply burned each year as waste. To date, attempts to profitably collect and use it for clean energy have almost all failed. In 2013, Craig Jamieson brought together and led a team of scientists from the International Rice Research Institute (IRRI) in their Philippines headquarters and the Supergen Bioenergy Hub in the UK to better understand why such a vast resource is being wasted. The IRRI-SUPERGEN "Rice Straw Energy Project" ran for 3 years, funded under the UK Government. When that project ended in 2016, Craig then started Straw Innovations Ltd with co-funding from Energy Catalyst Round 4. A pioneering 1000m³ test facility has been set up in the Philippines, led by Straw Innovations, with support from the Supergen Bioenergy Hub (Aston University), University of Southampton and QUBE Renewables. That 3-year, "mid stage" project ends in February 2020, so this second "mid-stage" project will continue and extend its work, focusing on three key innovations:

Trialing a novel way to harvest rice grains and straw simultaneously using a different design of combine harvester and adapting it to capture the straw. This will be lower cost than current harvesting options and will save farmers problems with straw management by removing it free of charge

Using biological pre-treatments to accelerate biogas production at lower cost than current state of the art

Feeding the biogas into a combined heat and power unit. The electricity will be sold to rice farmers for domestic use at less than half their current tariffs. The waste heat will be used to dry their rice, reducing losses and enabling it to be sold later at a higher price, sharing those profits with the farmers

These innovations will halve the cost of rice straw biogas production, making making cheaper energy available to rice farmers in a new business model, ready for scaling up. There are 150 million small-scale rice farmers globally and this approach could convert a ubiquitous waste into a source of clean, reliable and affordable energy for their productive and domestic use.

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

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Results of Competition: Energy Catalyst Round 7: Mid Stage

Competition Code: 1906_DFID_CRD_CGI_ENCAT_R7_MID

Total available funding is £32 million across early, mid and late strands

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
DWR OFFSHORE LIMITED	Floating Instream and Solar (FITS) Power Plant	£1,051,702	£736,191
FJR Engineering Consultancy		£13,917	£9,742
Royal Marine Engineering Co.,Ltd.		£264,767	£185,337
Sanda Hotel Co.,ITD		£56,600	£39,620
Spectrum SDKN		£71,469	£50,028

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Project description - provided by applicants

Awaiting Public Project Summary

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
SHERWOOD LIMITED	Clean energy for food security - Off Grid Cold Storage System (OGCS)	£571,272	£399,890
NAREC DISTRIBUTED ENERGY LIMITED		£7,238	£5,067
THE SOURCE PLUS		£208,954	£146,268

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Project description - provided by applicants

Delivering sustainable Cold-Storage for Food Security services in Off-Grid rural remote areas in the Sub-Sahara is challenging and requires an entirely innovative design to achieve clean energy, food security and economic development. Cold-Storage for Food Security has two distinct sections, firstly development of a solar micro-grid with novel compressed air energy storage (MGS), advantageously when the power store is providing electricity, cool clean air is supplied to the cold store reducing refrigeration load. Secondly the development of low-cost off grid cold storage system powered by the microgrid storage in Off-Grid rural regions.

Cold-Storage for Food Security translates into a proposal to test community led CE4FS projects in Kenya, engaging with 1,200 small scale farmers (800 women, 400 men with over 50% youth content) in remote rural regions to deliver microgrid storage & off grid cold store providing post-handling services, to reduce crop waste (currently 40-60%). There are 4 test sites each serving between 200-300 farmers, the service will be paid for through mobile wallet system using Safaricom the largest telecommunications provider in Kenya.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
I-RENEWABLE ENERGY LTD	Pilot project for local crowdfunding and monetisation of energy assets in Kenya	£320,000	£224,000
GIVEWATTS East Africa Ltd		£32,190	£22,533

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Project description - provided by applicants

Awaiting Public Project Summary

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
GOMMYR POWER NETWORKS LIMITED	eStreet microgrid-powered business park - Bumba Pilot	£416,090	£291,263
Apalia 24 RDC		£62,165	£43,516
IPX Extenso DRC SA		£1,015,393	£710,775

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Project description - provided by applicants

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
OXTO LTD	Affordable energy security through power stabilisation and voltage correction integrating flywheel energy storage solutions and renewable energy into the East African market	£1,245,147	£734,637
Ariya Finergy Holdings Ltd.		£228,466	£134,795

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Project description - provided by applicants

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
STEAMOLOGY MOTION LIMITED	W2W Zero Emission Energy Generation and Storage	£1,251,648	£876,154
Strathmore Energy Research Centre		£174,983	£174,983

Note: you can see all Innovate UK-funded projects here: <https://www.gov.uk/government/publications/innovate-uk-funded-projects>

Use the Competition Code given above to search for this competition's results

Project description - provided by applicants

This project will allow Steamology to demonstrate zero emission off grid power and storage at the micro grid scale in Kenya with our partners Strathmore University, specialists in Renewable Energy (RE) research and training.

Steamology is an innovative technology development company with an extreme engineering pedigree and a land speed record breaking heritage. Steamology is developing a zero-emission energy generation and storage system designed to be used with RE generation such as PV solar, geothermal or wind turbine.

Our W2W (Water to Water) system contains a compact energy dense steam generator. Steam is generated using energy stored as compressed hydrogen and oxygen gas in tanks. High pressure superheated steam is used to drive a turbine to do useful work generating electricity. RE is used to power electrolysis to generate and compress hydrogen and oxygen gas into storage tanks.

Traditional battery solutions for off grid energy storage use a wide range of often toxic or scarce chemistries such as Lithium, Cadmium, Lead, Antimony. These batteries have limited charging cycles (typically 500- 2,000) and do not have recycling plans in place for end of life.

The W2W system has:

- Zero emission - No CO₂, NO_x, SO_x, or particulates
- High power and torque - 10kW to 1MW range, scalable and modular units
- Low noise and thermal signature - Quiet vibration free operation, low temperature signature
- Operating temperature agnostic - Functional in a wide range of environments
- Low maintenance - Few moving parts made of standard engineering materials
- Without loss of performance over charging cycles -- Long life and service interval
- Without toxic or scarce materials -- No Pb, Sb, Cd, Li or other rare earth elements

It is widely accepted that global energy is required to meet net zero emissions by 2050.

Steamology have a product to meet this challenge and realise the market opportunity.

RE is plentiful but intermittent, 10,000 times more solar energy strikes the earth everyday than the world's total daily energy use.

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Bulk energy storage is required to convert RE into reliable electricity supply when demanded.

Steamology delivers scalable modular reliable off grid power on demand.

The W2W system is being designed to be sustainable with 'Cradle to Cradle' standards without rare, or toxic materials.

- Recyclable at end of life
- Manufacturable under licence in sub-Saharan Africa and the developing world
- Scalable to meet Global demand with existing resources

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