Specific energy storage applications sierra leone

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In Sub-Saharan Africa, population growth outstrips electrification, even while people increasingly rely on electrical equipment for communication and commerce. This lack of energy stifles economic growth and limits living standards and opportunities.

A study by Mobile Power in 2016/17 showed that 20 per cent of household income in Sierra Leone is spent on lighting and mobile phone charging. Most of these lighting costs are spent on disposable batteries, which creates an environmental issue and mobile phones are charged at "telecentres" in towns, powered by polluting and dangerous diesel generators.

The partnership between Professor Dan Gladwin, from the University"s Department of Electronic and Electrical Engineering, and Mobile Power began in 2017. The first project focused on the lifetime battery cells in pay-per-charge smart battery packs available to remote communities in Sierra Leone, to address the lack of grid-electricity in the country.

The pay as you go smart battery rental system, developed by Mobile Power, supplies affordable, clean power to poor households and enterprises in off-grid communities. The batteries are charged at solar charging stations before being delivered to customers, thereby removing the need for dangerous traditional diesel generators and reducing energy costs by up to 75%.

This second project will focus on developing significantly larger lithium-ion battery packs that can both store energy as part of a mini-grid and will be "hot swappable", meaning they can be rented out for household, transport and commercial use, such as to run fridges for medicines in hospitals, then returned back to the mini grid to be recharged.

Professor Dan Gladwin said: "These new battery packs can be swapped in or out of the micro-grid without shutting down the power system and are designed to maximise the life of the battery cells under different applications. They can one day be providing power to a whole village and the next day swapped out to drive the motor of an electric KeKes. For households where the cost of connection to the mini-grid is prohibitively high, these packs are easily carried to the home and are capable of powering multiple devices for long durations."

The partnership between Mobile Power and the University will enable research into pack design and its docking/charging system to optimise charging speeds, cycle life of the battery packs and the management of the hot-swappable system.

Jono West, Founder and Chair at Mobile Power and Project Lead, said: "We are grateful for the partnership

with Professor Dan Gladwin, particularly in his support and advice to date. We look forward to working closer together on this project."

There are two other project partners involved: Winch Energy, a global, off-grid energy developer and technology integrator, and Pink Power, a local non-governmental organisation (NGO).

Through these two partners, the project will be conducting field trials at two sites in Sierra Leone. Firstly, at Winch Energy"s mini-grid in Sierra Leone, where women will be employed as energy entrepreneurs, renting out the batteries for household and micro-enterprise use. The second will be at Pink Power"s site in Freetown, where a trial will take place to power electric tuk-tuk"s with the battery packs. This will be part of Pink Power"s wider project on training up vulnerable women to drive the tuk-tuks as a form of employment.

Jono West said: "Two of the greatest challenges facing the world in meeting the UN"s Sustainable Development Goals for Agenda 2030 are universal energy access (SDG7) and gender equality and women"s empowerment (SDG5). This Innovate UK Energy Catalyst project looks to find a way to allow SDG7 and SDG5 to mutually support one another, by empowering women entrepreneurs in the delivery of energy services in hard to reach communities through Mobile Power"s battery technology."