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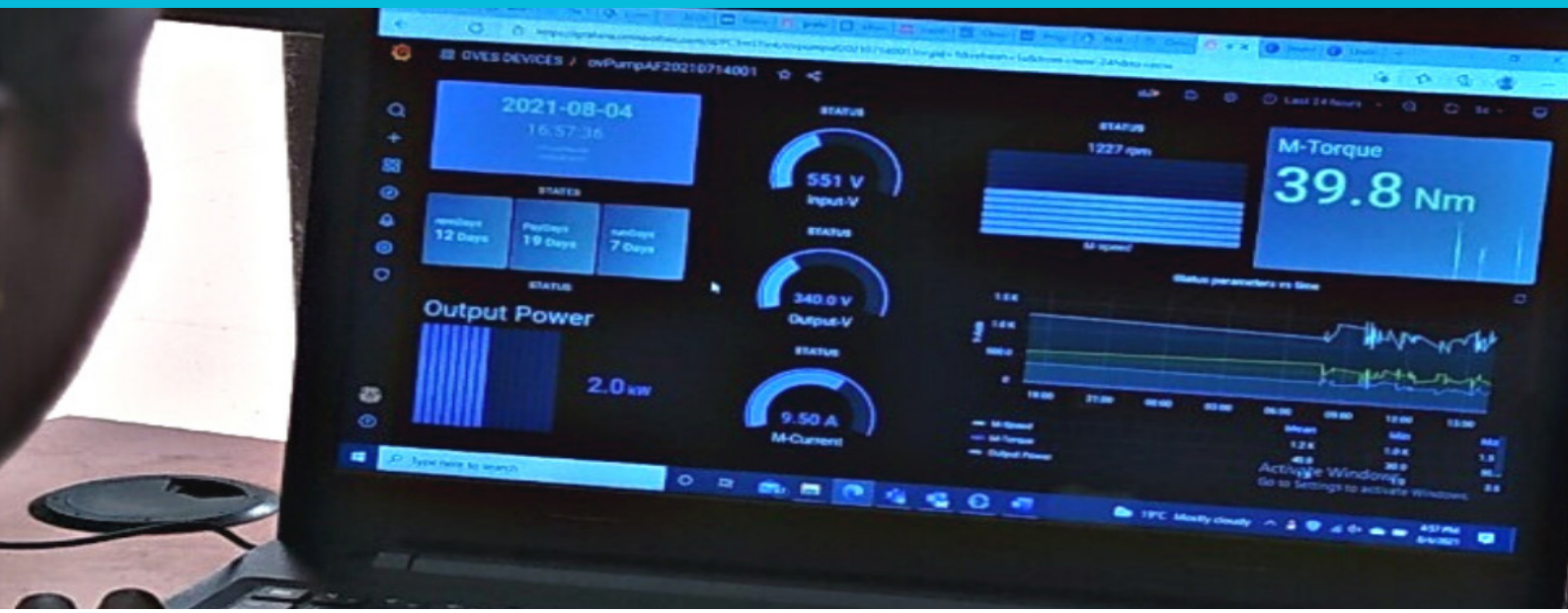
EFFICIENCY FOR ACCESS RESEARCH AND DEVELOPMENT FUND: INNOVATOR SERIES

MAKING DATA DISCOVERABLE



There is high demand for product and user data in the off-grid appliance sector. Access to data, such as battery performance and PAY-Go functionality and its analysis can help companies to understand how consumers use their products better. This will also enable companies to offer more tailored products and services to improve accessibility, affordability, and security for everyone along the supply chain including the end-user. For example, in the case of electric vehicles, access to data on mileage and battery usage can help electric bike (e-bike) fleet operators understand how vehicle charging and functioning can be optimised to run more efficiently.

However, accessing and processing data can bring many challenges. Data is generally difficult to access in off-grid solar products targeted at low-income populations due to constraints in power, computing and communication resources that connect to data services, such as the cloud. Moreover, there is no uniform or agreed industry-wide way of organising and presenting data. This can create issues when devices are retrofitted with technology to help access data, as each device is set up differently and so may require different software. Unfortunately, adding unique device access protocols after products are manufactured can increase the cost of the product for end-consumers disproportionately.

As a result, there is a need for open-source protocols and standardisation of technology components, so that manufacturers can design products that improve access to data platforms for web application purposes. Integrating these compatible, off-the-shelf products from manufacturers can help to create economies of scale and close the affordability gap for many appliance technologies.

DID YOU KNOW?

The global revenue for renewables monitoring and control is expected to hit USD 12.8bn in 2028

OMNIVOLTAIC'S HARDWARE MODULES AND DASHBOARDS AS A SERVICE (DAAS)

Omnivoltaic specialises in off-grid electric product technology. The company's team focuses on product design, sourcing, testing, managing manufacturing associates, and supporting vendors and distribution partners, with teams located in China and Kenya.

In the last two years, Omnivoltaic has conducted research and development on the Internet of Things (IoT) in the off-grid energy sector. As a result, Omnivoltaic is now a "full-stack", smart solar-home-system manufacturer. This is because the company not only creates the monitoring hardware for solar home systems, but also the off-grid, Pay-As-You-Go (PAYGo) appliances that support it.

OMNIVOLTAIC :

The Efficiency for Access Research and Development Fund has enabled Omnivoltaic to accelerate and expand an internal R&D project into a public-facing framework of off-grid device data discovery that can be deployed as a service to potential clients. This change of scope is significant."

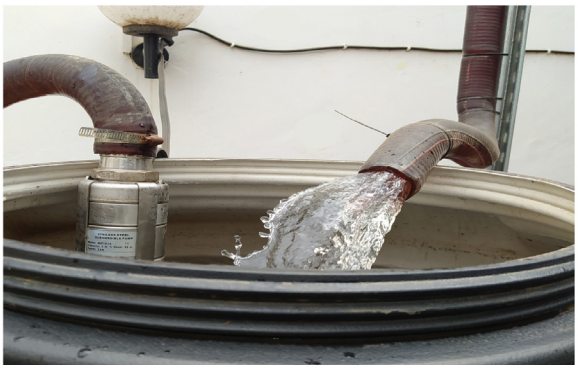
– Dr. Huashan Wang, Group Chief Technical Officer

WHAT IS A DATA STACK AND HOW CAN YOU DEVISE ONE?

In the off-grid appliance sector, there is a large range of original equipment manufacturers (OEMs), such as solar water pump manufacturers, ice makers and solar home systems. Each manufacturer has its own design and devices for capturing data, rather than one standard, industry-wide framework. Even if data is available in the cloud, it is not easy to use this information, as specific application or software can only generally access it.

Omnivoltaic's project involved developing an affordable and small, box-like device known as BridgeWare that aims to bridge the accessibility and compatibility gap between the underlying hardware of a range of off-grid technologies and a data store, such as 'the cloud'. The project aimed to create a technology stack to make devices discoverable, with minimal hardware additions needed.

BridgeWare is made up of a number of hardware modules and can be integrated into a range of solar off-grid products. Omnivoltaic has complemented this with a customisable 'dashboard as a service (DaaS)'. This displays all the product attributes that a service provider can choose to monitor, depending on technology type, business model and financing method, such as PAYGo.



Omnivoltaic device data discovery architecture can be described as a stack of three layers:

- BridgeWare, a lost-cost, easy to customise, interface module to specific OEM equipment via established data interface such as serial data-bus.
- A global data aggregator using flexible MQTT messaging standard, which communicates with the software, allowing for a two-way data relay.
- A GraphQL schema query language and API service that is opinionated and expandable.

PROJECT OUTCOMES

Omnivoltaic successfully created the hardware modules needed for the project's aims. The project developed a number of layers in the technology to make the data fully discoverable and customisable. This means that brokers or third parties can choose the data that is most useful for their business, including historical data, so that they can predict usage trends. The data is also available to third parties who can extract data from the database and format it in a way that is suitable for their needs. This could be through graphical display, diagnostics or analytics.

The project created the following modules:

- **Data Dashboard as a Service (DaaS™):** Omnivoltaic successfully created its data dashboard as a service. The dashboard is fully customisable, and Omnivoltaic works with suppliers to choose which items suppliers would like to monitor, depending on the technology it is using.

- **dOS™ :** A device operating system that helps exchange information, including third-party components. Omnivoltaic useda module that interacts with devices and obtains its operating performance status. It then organises the data into a standardised format.

- **BridgeWare™:** A low-cost, easy to use piece of hardware that communicates data to the cloud. The communication layer is independent of infrastructure, so it can upload the data on any network, including 2G, or Wi-Fi. This allows the relevant data to be uploaded to the cloud continually.

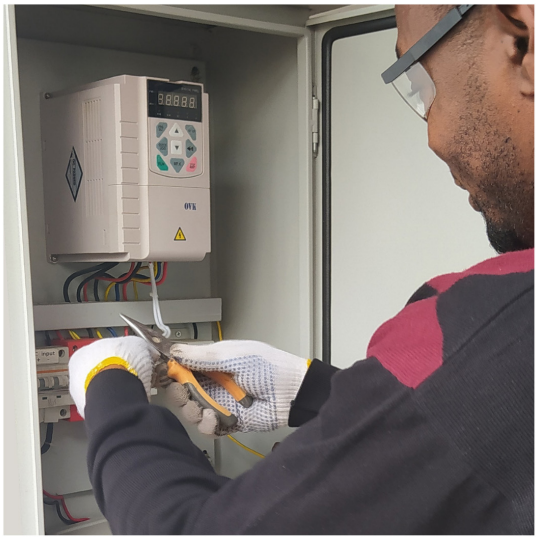
- **Avatar™ Device Cloud Shadow:** Avatar is an abstract digital interface for physical devices, without the need for communication media. Direct communication with devices from the cloud makes them highly vulnerable to cyber-hacking and becomes increasingly challenging due to intermittent connectivity in off-grid regions. Using a 'cloud twin' makes it easier to put safeguards in place while maintaining a link to the physical device.

- **Global Device Data Messaging Central:** MQTT server supports dOS™ and BridgeWare™ by allowing two-way data relay. All devices stream data to the broker, and then the broker can dispatch this data into various applications, after which commands can be sent back to the device.

WHAT DID WE LEARN?

Customisable dashboards offer customers monitoring possibilities.

Omnivoltaic was surprised at how easy it was to construct dashboards once the basic building blocks were in place. Dashboards and informatics make it easier for individuals and organisations to understand data analytics. This is because presenting a range of device data simply on a dashboard enables service providers or asset owners to easily monitor their products.



Education and market training are vital to scaling up the DaaS model.

Although discoverable data can be highly beneficial to manufacturers, business practitioners, industry bodies, investors and end-users, a customisable, standardised format, such as Omnivoltaic's product, is not widely known. Therefore, there is a need to educate different stakeholders and manufacturers about the breadth of options available. This canl help increase uptake of Omnivoltaic's hardware among OEMs.

Extracting legacy data requires partnering with OEMs.

Although it was evident that some form of physical data exchange was required, a major learning was deciding where to place this intermediary and how to extract legacy data from OEM equipment. Omnivoltaic found that machinery makers had not previously considered how to convey data to the outside world. These devices are internally data-rich, but OEMs were reluctant to let third parties look and extract data from control firmware. Omnivoltaic found that the solution to encouraging OEMs to agree to data exchange was to provide insight into equipment functionality and how the control data is organised, so that data extraction is safe and complies with data protection laws. Omnivoltaic found that the data that it required was easy to obtain and harmless to disclose, once the company had framed the technical discussions in the right way.

WORKING WITH OEM SUPPLIERS: WHAT IS THE FUTURE OF MAKING DATA DISCOVERABLE?

Omnivoltaic intends to deploy test sites and new live devices in global dashboards that are open to the public via GitHub Pages. The company is working with OEM suppliers to test the hardware, such as appliance manufacturers of e-mobility, solar water pumps and cold chain solutions. Omnivoltaic also intends to create training sessions with its current client base to promote the technology and gather feedback.

Omnvoltaic also learned that the actual variability of "status data set" cross OEM equipment types is minimal and that hardware differences in terms of data exchange buses are also manageable. The Omnivoltaic team learned that dividing BridgeWare into OEM specific data-interface and OEM-agnostic messaging modules makes it easier to make low-cost BridgeWare hardware.

GET IN TOUCH:

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