

# The Off-grid Bazaar

## A Digital Tool to Enable Financially Sustainable Business Models for Solar Water Pumps

### The challenge

Renewable energy technologies such as solar water pumps can leverage cross-benefits between water, energy and food. Access to irrigation technologies not only improves the yields of the crops but also reduces vulnerability to changing rainfall patterns. In addition to that, it enables multiple cropping practices and improves farming efficiency which can stimulate socio-economic development in the agriculture sector, and help to fight poverty.

However, there are challenges at different levels that inhibit the adoption of this technology. In most areas, the technology is not available. But even if technology providers are present, scientific project design methodologies are not applied, and the identification of the capacity of the solar water pumping system mostly depends on crude estimation. This results in the selection of solar water pumping systems that do not reflect the accurate water requirement of a farmer. Mostly systems are oversized, the cost for farmers is too high and they are not able to leverage the envisioned income benefits, or are even unable to repay their loans. Furthermore, the high costs associated with project development and customer acquisition is a major deterrent for companies to enter the market. In addition, farmers are hesitant to invest in solar water pumps because of the high up-front cost.

### Our approach

The Renewable Energy for Rural Areas (RERA) programme is a bilateral programme of the Government of Nepal and the

Government of Germany to support the decentralized renewable energy sector in Nepal. The programme is jointly implemented by the Alternative Energy Promotion Centre (AEPC) and by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ).

The programme aims at creating markets for off-grid energy technologies and services by (1) supporting the government of Nepal in creating a conducive policy framework, (2) strengthening the private sector with innovative business models and technologies, and (3) improving the access to finance. As part of the private sector support, RERA focuses on innovative approaches for the agriculture and energy nexus, to increase productivity, income generation and stimulate low carbon economic growth. On this backdrop, RERA entered into a PPP with Gham Power, a private solar company that started operations in Nepal in 2010, to support the scale-up of solar water pumping technologies based on financially sound business models for farmers, project developers and investors.

### The solution

Gham Power is developing a web-based project development platform, called the Off-grid Bazaar. The platform functions based on data gathered from farmers, such as geographical location, cropping pattern, land area, and the climatic conditions. The inbuilt algorithm then calculates the water requirement of the farmer and determines the optimal size of the solar water pumping system. Once the pumping system has been selected, the project gets listed on the platform along with the detailed



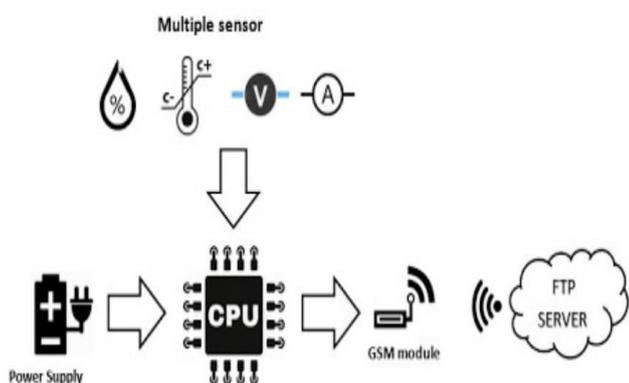
L. to R.:

- A Solar Pump used for irrigation at Bansgadhi, Bardiya (Solar Pump installed by Gham Power)
- Solar irrigation field of Bansgadhi, Bardiya (Solar Pump installed by Gham Power)

cash flow projections based on the estimated yield, as well as the farmer's revenue generating potential. The platform is targeting two categories of users: developers and investors. For developers the platform provides a project sizing tool, which determines the most efficient size of a solar water pump for a particular application through algorithm. Then, the platform presents these projects to investors who can invest in them through the platform.

The web platform also encompassed a risk assessment tool that can be used by investors and financial institutions. Based on historical yield data, local market prices, meteorological data, land area and the cropping pattern of a farmer, the platform delivers an estimation of a farmer's yield as well as the corresponding revenue. By demonstrating the financial soundness of the projects and convincing investors, the off-grid bazar addresses the access to finance challenge stemming from the front-loaded investment cost.

The web platform also incorporates data from a Smart Meter included in the solar water pump (see the block diagram below). The Smart Meter is a GSM/GPRS based device to remotely turn on/off the system that has sensors to measure different parameters such as voltages, current, temperature, soil moisture and humidity. Thereby, the platform can optimize its algorithm to predict irrigation requirements based on actual data from the field. Additionally, the Smart Meter operates as a pay-as-you-go device to ensure that repayments are done on time. The integration of remote



monitoring and mobile payment minimizes the risk of default for Gham Power.

RERA and Gham Power are working together to demonstrate the viability of the technological and conceptual innovation to understand the user behaviour, as well as to gather on-site data in order to validate and refine the model and algorithm. 20 water pumps will be piloted as part of this cooperation. A commercial bank provides 70% loan for the solar water pumping system to the farmers. Gham Power provides security to the bank on behalf of the farmers, and RERA contributes with 30% of the overall project cost as a grant.

## Value Addition

After the algorithm is refined and the approach has been proven through the pilot, the platform will deliver the following value additions to multiple stakeholders in the agricultural value chain:

**Banks/ Financial Institutions:** The platform will help banks/ financial institutions to diversify their portfolio and enter a market which they perceive as risky. The platform will have ready to finance projects and help banks determine the credit-worthiness of farmers. Additionally, the integration of mobile money and smart metering minimizes their operational cost.

**Policy Makers:** The collected and generated data allows for spatial planning and designing targeted support programmes, and can drive the formation of new policies.

**Developers and Installers:** A virtual aggregation of listed projects minimizes project development cost for the project developers. The installers can keep track of new projects financed by the banks, which they can bid upon to install the project.

**Farmers:** The platform enables rural farmers to access the banking ecosystem by providing better analysis and projections of their water requirements and the resulting yields. Right sizing, optimal mix of crops and access to reliable irrigation will make the solar water pump profitable to farmers.

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