B-BRIDDHI

CASE STUDY

SOLSHARE:
ESTABLISH IMPACT EVIDENCE THROUGH INNOVATIVE FINANCE

A programme by

Supported by Switzerland

Roots of Impact

LightCastle Partners

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ELECTRIC VEHICLES: THE FUTURE OF TRANSPORT IN BANGLADESH

Bangladesh, a fast-emerging but still predominantly rural country in South Asia is hardly the conventional destination that is imagined to be undergoing an electric vehicle revolution. Yet electric vehicles (EVs) already have a massive socio-economic footprint in this country, where battery-run electric three-wheelers (BRTW) have transformed daily life for tens of millions of rural citizens by offering fast, accessible, and truly affordable passenger transport.

There are an estimated ***1.25 million to 2 million three-wheelers in Bangladesh*** *(about equal to the stock of registered electric vehicles in the US), which is largely owed to a growing number of rural entrepreneurs who are offering EV taxi services.*

The emergence of BRTWs has spawned ancillary services, which are creating thousands of manufacturing and service jobs in charging workshops, motor repair, battery manufacturing, and light engineering. 70% of the parts for these vehicles – including the chassis, body, wheels and batteries – are manufactured domestically. Consequently, a nascent opportunity exists for the development of a domestic EV manufacturing sector. Several private sector actors, both local and foreign, have already committed investments surpassing US$ 1Bn to developing the market.

Government support and incentives for the sector are strong, too. This is due to the fact that the transport industry is the highest GHG-emitter and accounts for a staggering 63% of total fuel consumption in 2020[1]. The three-wheeler EV market is here to stay in Bangladesh, despite challenges including, the lack of charging infrastructure, the absence of skilled labour, limited financing opportunities, competition from traditional vehicles and underdeveloped battery technology.

The development of **battery technology is particularly consequential** to the environmental and economic impact the sector has. Currently, lead acid batteries dominate the market, since they are domestically manufactured and hence more affordable and available[2]. However, these batteries are inconsistent with global EV best practices and generally perform poorly on parameters of efficiency, durability, charging time, long-term cost to vehicle owners, and environmental pollution, as compared to the industry-standard lithium ion batteries. The integration of lithium ion battery technology into the EV ecosystem in Bangladesh is therefore critical to its continued growth and sustainability. As a result, the **electric three-wheeler charging market with an estimated total addressable market of around US$ 5Bn**[3] represents a tremendous opportunity for investment. Concurrently, it provides the chance for inclusive economic growth by better-equipping the traditionally low-income EV drivers in participating in this fast-growing market.

CATALYSING CHANGE: IMPACT READY MATCHING FUND

The Impact Ready Matching Fund (IRMF) is a catalytic financing instrument that is primarily focused on institutionalising impact management and measurement (IMM). The IRMF is generally targeted towards early-

1 Energy and Mineral Resources Division

2 LightCastle Analytics Wing

3 LightCastle Survey

IRMF disbursements are made in three tranches, which coincide with three milestones, namely (1) developing a Theory of Change and identification of key impact metrics, (2) establishing a sound IMM system, and (3) delivering an impact report.

Through the IRMF program, Biniyog Briddhi (B-BRIDDHI) provides feedback to impact enterprises that helps them to carefully conceptualise the type of impact they want to create and design a feasible system to effectively implement, manage, and measure the claimed impact. Unlike Social Impact Incentives (SIINC), which is another catalytic financing instrument offered by Biniyog Briddhi, IRMF targets impact startups that are at an earlier stage and with a less developed understanding and practice of IMM. Also, IRMF candidates share a standardised set of milestones, whereas the impact target of SIINC is tailored to the individual business and impact model of the specific SIINC candidate.

SOLshare is a recipient of the IRMF and presents a unique case as it has been in operations for a longer time and has a more mature Impact Measurement system in place as compared to other candidates. However, a ramp-up of government efforts towards the end of 2020, which was meant to expand the highly subsidised national grid across the country, triggered a reevaluation of SOLshare's primary business model in order to deliver additional impact.

The reason for this move was that the national grid posed a fundamental risk to SOLshare's solar mini-grid vertical. Consequently, the enterprise pivoted into the EV sector with two key goals: (1) technologically transforming the nascent sector and (2) serving EV drivers who on a typical day travel 100-200 km and earn just US$ 10 before vehicular expenses.[3] This pivot in business and hence impact model also meant that SOLshare needed to renew its IMM system and establish a new impact baseline at a crucial time. This was an endeavour that the IRMF programme actively supported to ensure that the newly conceived vertical, SOLmobility, stayed true to SOLshare's commitment to impact in the domain of inclusive clean energy.

SOLSHARE: BRINGING AFFORDABLE SOLAR ENERGY TO BANGLADESH

SOLSHARE'S ORIGINS, TARGET POPULATION, MARKET, AND NEEDS

During his academic research in renewable energy, the company's German founding director, Dr. Sebastian Groh, was taken aback by the sheer number of Solar Home Systems (SHS) in Bangladesh, which outstipped Germany, and served about 25 million people at the time.

Nevertheless, excess levels (up to 30%) of energy loss occurring from the existing SHS program in confluence with the large market size **(60 million individuals were still living off-the-grid)** created a business opportunity for a tech-enabled renewable energy company. Consequently, Sebastian and his co-founders conceived the commercialization of a solar mini-grid with peer-to-peer energy trading capabilities. They founded SOLshare in 2014 with the goal of empowering rural communities by deploying affordable and accessible renewable energy solutions. Since then, the company has leaned heavily into IOT technology. It has also expanded its portfolio to include clean energy solutions for the transportation sector, which is simultaneously a leading employer and GHG emitter in the country.

DEEPER DIVE INTO THE SOCIAL PROBLEM

It is estimated that electric three-wheelers transport **25 million people in Bangladesh each day and have created employment for 3.0 million people,** particularly from lower-income households. Rural sole proprietors are purchasing BETWs at a typical investment of around US$ 2000 to offer taxi services in rural and periurban regions. These entrepreneurs rely on a growing network of over-night garages, which charge a nightly fee of around US$ 2 and offer parking and charging services. These relatively modest operating costs and the lack of dependance on fuel helps these drivers earn a gross income of US$ 10 on a daily basis, while still offering affordable rides to passengers. However, **drivers must make monthly payments to purchase their vehicles as well as the replacement vehicle batteries**, which creates a heavy financial burden.

Under ideal conditions, drivers would not have to shoulder this double burden in the long-term. However, the predominance of cheaper low-quality lead acid batteries in the market means that drivers are being forced to replace batteries more frequently. Hence, they find themselves in an inextricable cycle of monthly instalments and premature battery deaths. Furthermore, the e-mobility charging infrastructure in Bangladesh is largely fossil fuel powered and informal in nature, which leads to unauthorised diversion of energy from the national grid and high risk of improper battery recycling and disposal.

Beyond short life spans, lead acid batteries also have lower capacity and require additional charging time. The former leads to range anxiety for drivers. The latter has encouraged the practice of overnight charging, which also entails overcharging, depreciating battery lifetime further and posing a fire hazard. Given that drivers already face many hurdles such as high-interest rates, debt/financing issues, and registration problems, lithium ion batteries, which offer **70% greater efficiency, take a fifth of the time to charge (meaning more time to be in business and serve customers), and last more than twice as long** can be key to improving the livelihoods of BRTW drivers and spur growth in the EV sector.

SOLUTIONS AND OPPORTUNITIES

In late 2020, SOLshare, which at that point had already been operating in rural Bangladesh for over half a decade, decided to take a close look at the problem. This was part of the enterprise's strategic pivot to reduce dependency on its solar mini-grid business. SOLshare piloted lithium-ion batteries with BRTWs, adapted its **Pay As you Go (PAYG) technology** and integrated these batteries to create further value for EV drivers. The technology meant greater asset securitization and hence opened the door to more affordable financing models and opportunities to engage garage owners and financial institutions. This marked the inception of SOLmobility and a reimagination of SOLshare's business, which now consists of the following verticals:

- **SOLmobility:** IoT-based PAYG lithium ion battery leasing model with smart metered charging stations that allows rickshaw pullers to fast-charge during the day.
- **SOLclock:** High-efficiency, low-cost PAYG technology solution offering to make consumer electronics accessible.
- **SOLgrids:** Interconnecting households and micro-businesses within the peer-to-peer network and allowing users to sell excess electricity.

Under the SOLmobility vertical, SOLshare partners with garage owners who are interested in leasing batteries to BRTW drivers. These garage owners then procure lithium ion batteries that are up to SOLshare's specifications. Lastly, the batteries are outfitted with **SOLbat**, a patent pending battery advancement technology that allows remote control of the battery, by garage owners.

SOLshare's platform provides battery financing, remote battery monitoring, and leasing with PAYG (Pay As you Go) technology. As a genuine triple win solution, this allows electric three-wheeler drivers to enjoy extended battery lives, increased cost savings, and higher mileage. Garage owners, on the other hand, can enjoy remote monitoring, transaction tracking, and shorter charging cycles. This, in turn, increases the income of both the electric three-wheeler drivers and the garage owners. SOLmobility can generate revenue from hardware integration charges and daily SaaS fees to activate SOLbat.

SNAPSHOT OF SOLSHARE'S BUSINESS & IMPACT CASE

PRIMARY BENEFICIARY

SOLshare launched its smart battery technology, in May 2022, through its growing network of partner charging stations.

PRODUCT COMPETITIVENESS

Compare to lead-acid batteries SOLmobility's batteries are

- **70%** more energy efficient
- **Twice** as durable
- **5** times faster charging
- **Half** as expensive for EV drivers

MARKET GAPS AND OPPORTUNITIES

- Market Size Country-Wide: ~3million EV Drivers
- Market worth: US$ 4.85 Bn addressable market
- Number of EV's: over 1.75 million BRTWs

USER PROFILE

Average Age of Drivers: 35 years
Average Daily Income of Drivers: US$ 10
Gender: 100% Male
Family: More than 50% are married

SOCIAL IMPACT OPPORTUNITIES

- Significant increase in the daily incomes of EV drivers
- Enhanced security and scalability for EV charging garages
- Major reductions in environmental damage due to improper battery disposal
- Broader scope for institutional participation to finance EV sector growth

Target geography: Rural & Peri-Urban

Locations Served: Dhaka, Khagrachori, Rajshahi

During this transformation, SOLshare is receiving technical assistance and a matching fund of US$ 100,000 over a 14 month-period from the IRMF programme. **SOLshare's transition into the e-mobility space is proof of how crucial it is for startups to be responsive to ongoing market shifts and trends.** It also demonstrates how the Impact Measurement and Management system of an impact enterprise needs to evolve as the business model is shifting. For example, SOLshare needed to go back to square one and start collecting baseline data about an entirely new target customer group: the EV drivers.

Questions emerged such as "How much do they earn right now? When is the peak hour for them? When in the day would they prefer to recharge their battery?" Only equipped with such data is it possible to demonstrate

how SOLshare's batteries and services help improve the lives of EV drivers. In this case, the IRMF framework came in and catalysed the reestablishment of a new IMM system that is aligned with SOLshare's new business and impact model. This entailed the development of a new Theory of Change, the achievement of an ideal product market fit, and the creation of an impact data collection system.

TRACTION & SOCIAL IMPACT

SOLshare has earned US$ 434,000 from SOLmobility in FY 2021/22 alone, which makes for an impressive progress in the span of just one year. This result is expected to triple by FY 2022/23. SOLmobility already has 5 operational charging stations in its network and a pipeline of 5,000 to 10,000 smart batteries per month. Its battery leasing model is expected to **raise the daily incomes of EV drivers by as much as 34%** and can extricate tens of thousands of struggling drivers in the sector from a vicious cycle of debt.

Through game-changing features such as integrated digital payments, real-time monitoring, and remote battery control, SOLmobility's platform removes several barriers in the EV charging industry. This will drive formalisation and encourage investments from both existing market players as well as new entrants and formal financial institutions. With this, SOLmobility is at the forefront of the multi-billion dollar BRTW charging market and in a prime position to realise the sector's economic and environmental potential. SOLshare won the Zayed Sustainability Prize in 2022.

> *"We got engaged with the IRMF program at the initial stage of our pivot. The program helped us build a new vertical, develop a comprehensive theory of change, and quantify the dimensions of impact we expect out of SOLmobility"*
>
> *- Salma Islam, Head of Projects, Fundraising, and Communications, SOLshare*

LOOKING TO THE FUTURE

SOLshare will continue to pave the way for innovative clean energy applications in Bangladesh. This can be achieved, by serving the growing Bangladesh EV market and approximately 3 million BRTW drivers as well as, by optimising charging and solar infrastructure with its technology.

Within the next 3 years, the company aims to power 100,000 safe electric vehicles with smart solar panels, increase monthly income for the EV drivers by twofold, and facilitate a successful convergence of the energy & transport sector in Bangladesh based on distributed solar panels and storage. Or, as the company puts it, "by marrying 6 million solar home systems to 1.75M electric rickshaws existing today in an optimised charging and electricity infrastructure."

Now, SOLshare is contemplating new interventions to help charging stations get a portion of their energy from solar panels. This can further reduce the carbon footprint of the EV sector. Fr example, the company established its first net-metered solar-powered garage in Rajshahi in December 2021, which can feed excess electricity into the national grid.

Technological efforts are being made to create deeper synergy with the national grid. SOLshare's ambition is to develop a remotely controllable virtual power plant. Such a plant would transfer power to the national grid by leveraging underutilised lithium ion batteries, such as those in EVs and solar home-systems, during peak hours, boosting national energy self-sufficiency. The company expects to have access to half a million underutilised lithium ion batteries by 2025. Through efforts and diversified business strategies, SOLshare aims to increase the share of renewable energy in Bangladesh's energy mix.

SOLshare envisions itself as an high-impact technology company and is keen on working with B2B partners to promote the widespread adoption of lithium ion batteries and PAYG technologies to keep growing its SaaS revenue streams. If current projections hold, SOLmobility stands to earn US$ 58Mn in revenue by FY 2026/27.

As the company strides forward, the **IMM system built under the IRMF framework will play a vital role in tracking and maximising the various social and economic impacts the company is so well-positioned to make in Bangladesh's energy and EV sectors.**

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