Solar Integrated Battery Swapping Station

Case Description

Scaling adoption of Electric Vehicles (EVs) has its own set of challenges, major one being the need of supporting infrastructure for EV charging. While the traditional Internal Combustion Engine Vehicles (ICEVs) were dependent on fuel stations, transition to EVs necessitates adequate electric charging infrastructure. Another major challenge faced is the charging time, a major convenience factor for EVs. The industry is introducing solutions such as fast EV chargers and battery swapping stations to overcome these barriers. In the battery swapping model, the battery is decoupled from vehicles and rather than charging the electric vehicle, exhausted battery is exchanged with a fully charged battery at a swapping station. Since the user need to just swap the battery, process takes only a few seconds to few minutes. Currently, India's EV market is momentous because of the significant number of two-wheeler and three-wheeler vehicles. Since these vehicle segments have high utilisation rate, the battery swapping or battery as a service is seen as an important solution.

Swappie is a battery-swapping station developed by SKS Cleantech, currently offering battery swapping services to the three-wheeler EV segment. The company relies upon solar-grid hybrid technology, where 50% of the energy is procured through the grid and the remaining 50% is met through solar panels. Use of solar electricity reduces the demand for grid electricity which has a direct impact on EV footprint. The EV revolution in the current phase is more focused on its penetration in Tier I cities. To promote this transition to Tier II & III cities and to further overcome the challenge of unreliable power supply challenges faced by the Tier II & III cities, innovative solutions like Swappie can be a game-changer technology.

Figure 1: Solar panels used to charge batteries
Figure 2: Battery Swapping station

Details of Business Model

Currently the only live Swappie (SKS Cleantech's battery swapping station) has 15 batteries and caters to 25 three-wheeler vehicles

- Capital Expenditure (CAPEX): INR 20-25 Lakh catering to 20-25 vehicles (equipment cost including-solar panels, proprietary swapping station and batteries)

- Operational Expenditure: 13-15% of the CAPEX per year
- Internal Rate of Return (%): 30-35% for 5 years tenure and 22-25% for 15 years tenure (SKS Cleantech 2022 Analysis)

Impacts

- The quick swapping helps vehicle operators save charging time and increase their daily income. For instance, an EV three-wheeler that earlier used to cover a distance of 70-80 km daily, now covers more than 120 km with the help of battery swapping service.
- By relying on a hybrid (solar-cum-grid) charging, the company saves 1.3-1.5 Kg of CO_2e emissions on every unit (kWh) of electricity consumed.
- Every franchise of Swappie provides 2-3 green jobs- one swapping operator and one service level engineer handling operations and technical maintenance.

Innovation

The company relies on technology innovation, business model and user affordability to pillar its success. Innovations by the company include-

- Affordability: Affordable charging cost because it relies on a solar-grid hybrid charging mode. Swapping a single battery at Swappie is INR 3-3.5/kWh, which is lesser than the regular charging cost.
- Renewable-based charging: using solar energy for charging EV batteries helps circumvent the barrier of grid instability

About Pioneer

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Geography

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