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Session : Electric Mobility

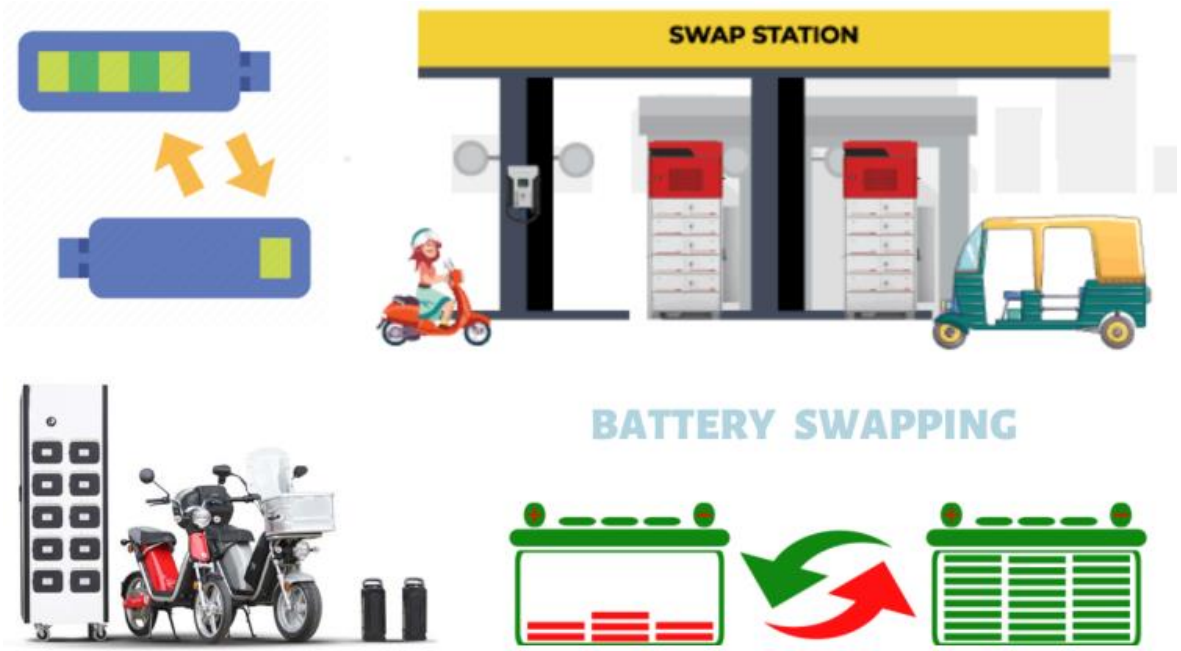
Opportunity For Battery Swapping In India

Presented By

Eshwar Pisalkar, Head Charging Infrastructure, BEM

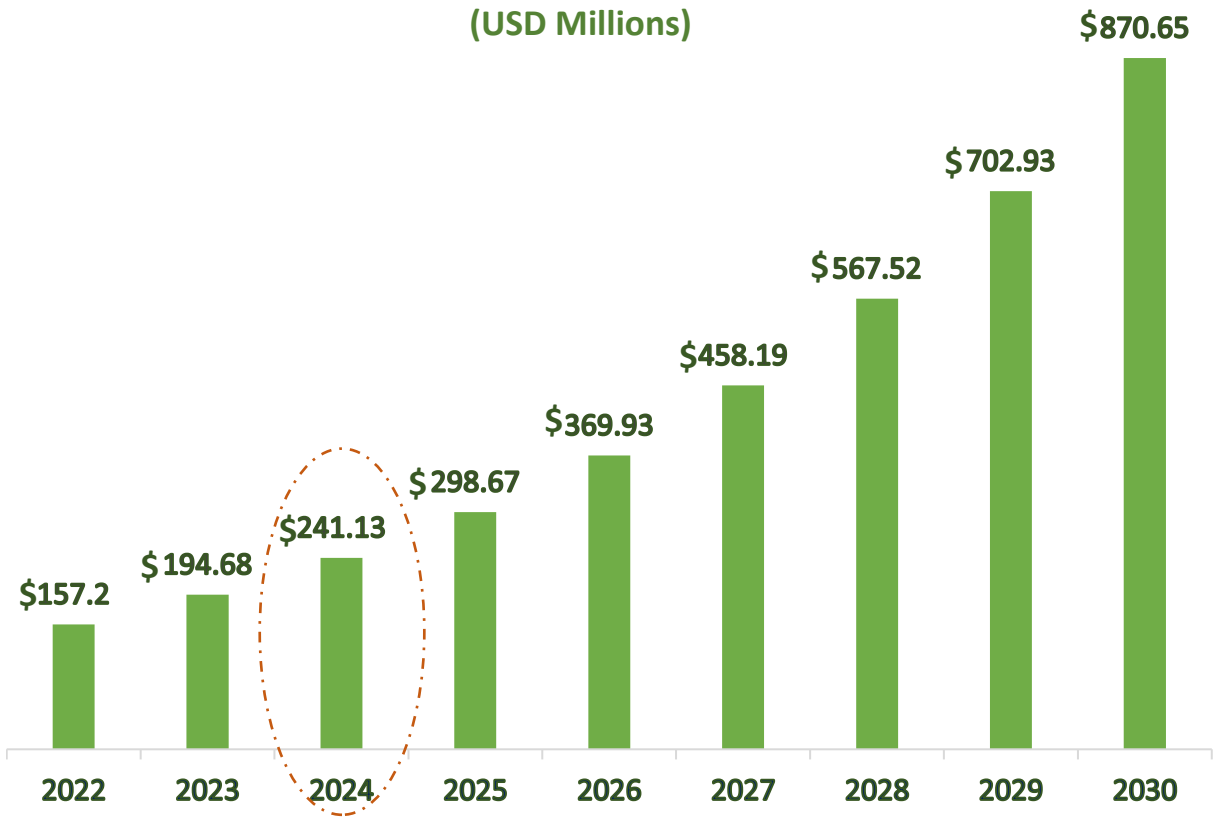
CONTEXT

- Global market overview of battery swapping business
- Indian battery swapping market overview
- Total Cost of Ownership (TCO) analysis
- Potential opportunity in India for stakeholders
- Conclusion & Key Takeaways



Global Market Overview Of Battery Swapping Business

EV Battery Swapping Market Size, Year 2022 to 2030
(USD Millions)



Market Size in 2024	CAGR 2024 to 2030	Market Size in 2030
USD 241.13 Million	**24.4%**	**USD 870.65 Million**

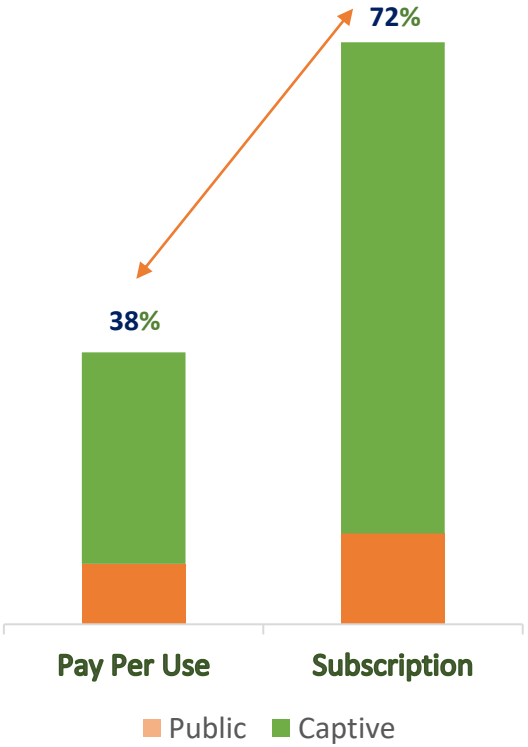
EV Battery Swapping Business Model Type

Pay Per Use Service

- Limited public accessibility due to lack of government policies
- Restricted public-private partnerships between OEMs and operators

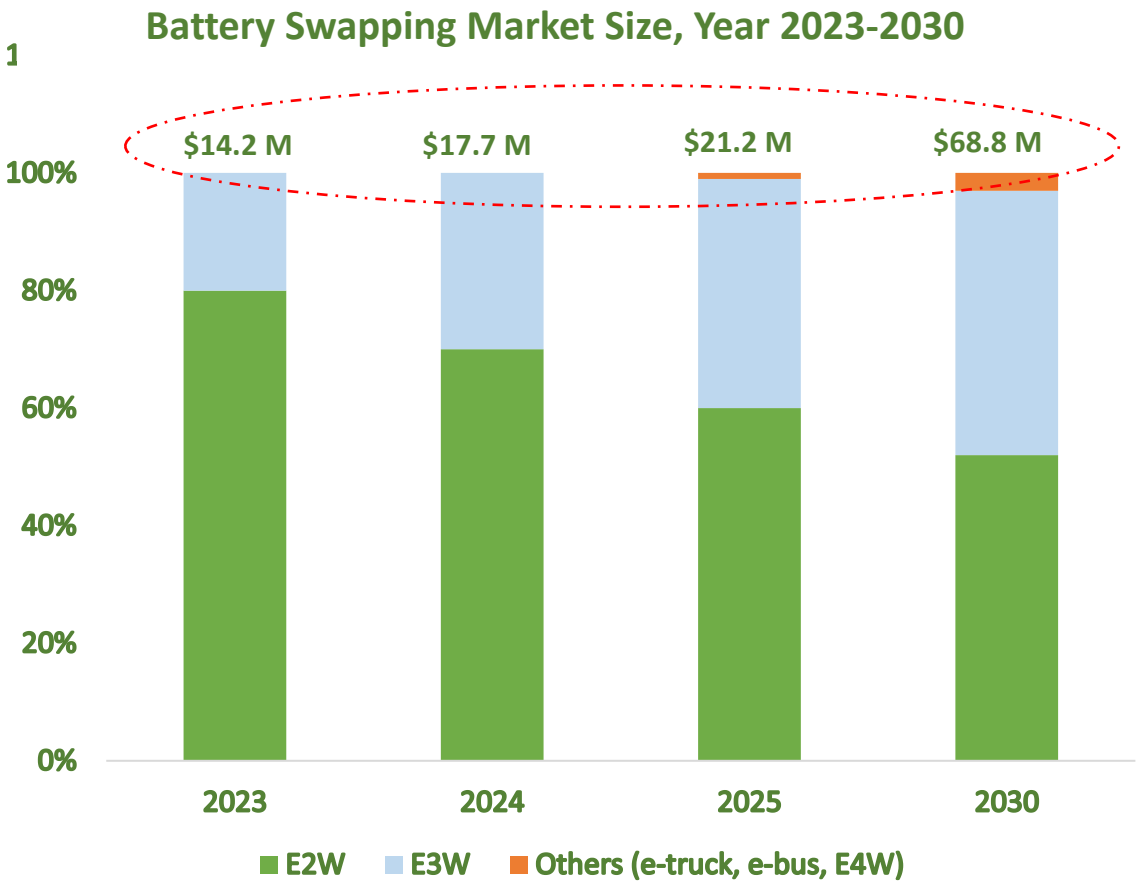
Subscription Service

- Appreciated by end users for unlimited swaps under one time subscription fee
- Majorly deployed in privately owned premises or B2B partnership
- Known for closed-loop operations, short distances, and time-saving over traditional charging methods.



Source: JMK report 2024

Indian Battery Swapping Market Overview



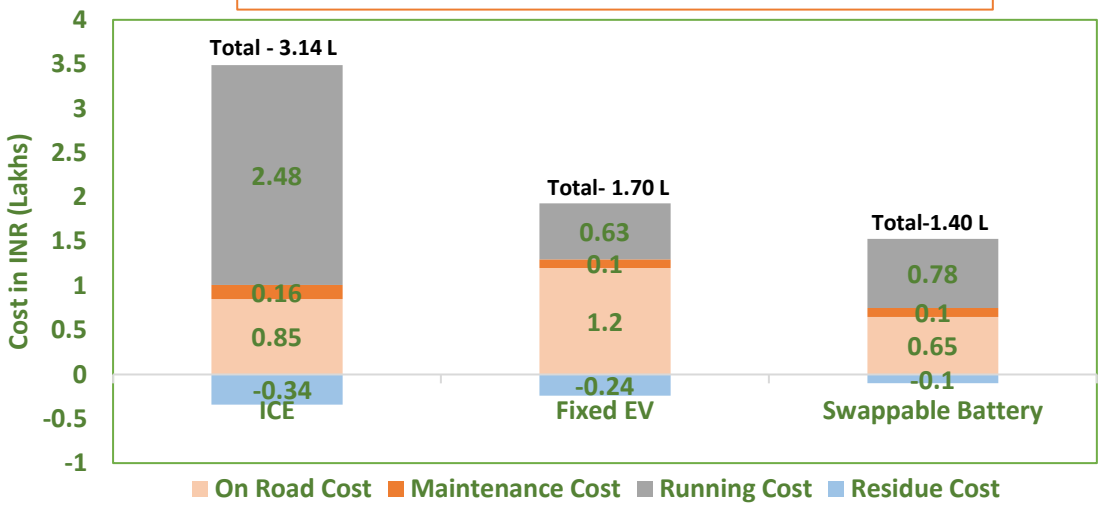
Market Size in 2024	CAGR 2024 to 2030	Market Size in 2030
USD 17.70 Million	**25.5%**	**USD 68.80 Million**

- Over **2,500 swapping stations** have been installed across India, facilitating **nearly 13 crore+** swaps by **over 20 operators** for E2W and E3W.
- India is emerging **as the second-largest battery swapping market** in the Asia Pacific, following China.
- **Indian Oil** in partnership with **Sun Mobility** to deploy swapping station at 40+ cities.
- **Battery Smart & Volt Up** have partnered with **Adani Power** to expand swapping infrastructure in Mumbai city.
- **Greaves Electric Mobility** partnered with **Indofast Energy** (JV of Sun Mobility & IOCL) for Battery swapping technology.
- On January 10, 2025, the **Ministry of Power, GOI**, issued a policy providing guidelines for setting up **swapping infrastructure** in the country.
- **Zomato** and **Zepto** have signed agreements with **Hero Electric** to deploy **500** swapping stations in Tier I cities by 2025.
- Gogoro and Yuma have planned to deploy **1,000** swapping stations across Tier I and Tier II cities by 2026.
- **NITI Ayog** and **ICCT** projected requirement of **over 10,000** swap station for E2W & E3W to reach market revenue of **$68.8 M by 2030**.

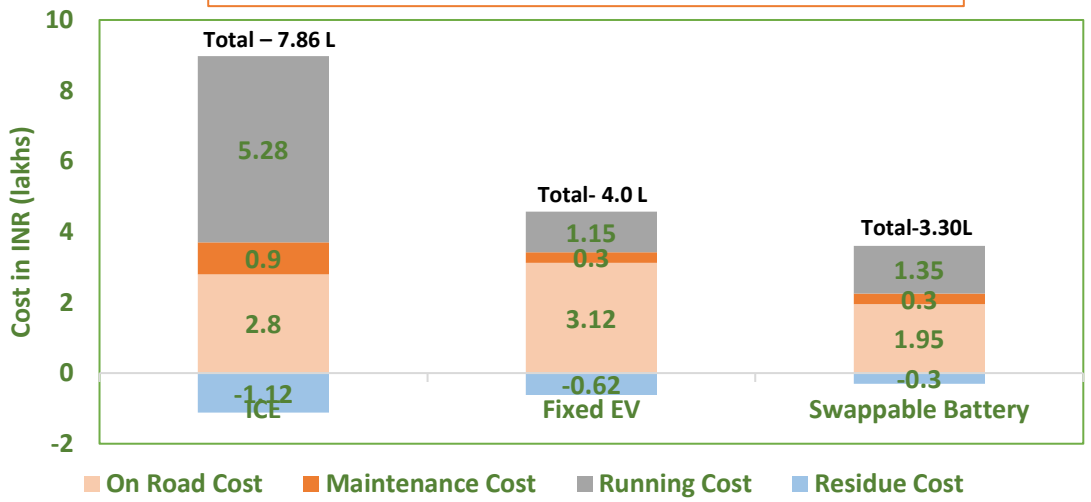
Source: IESA & ICCT report 2024

Total Cost Of Ownership (TCO) Analysis

TCO Analysis for E2W (5 years Life Cycle)

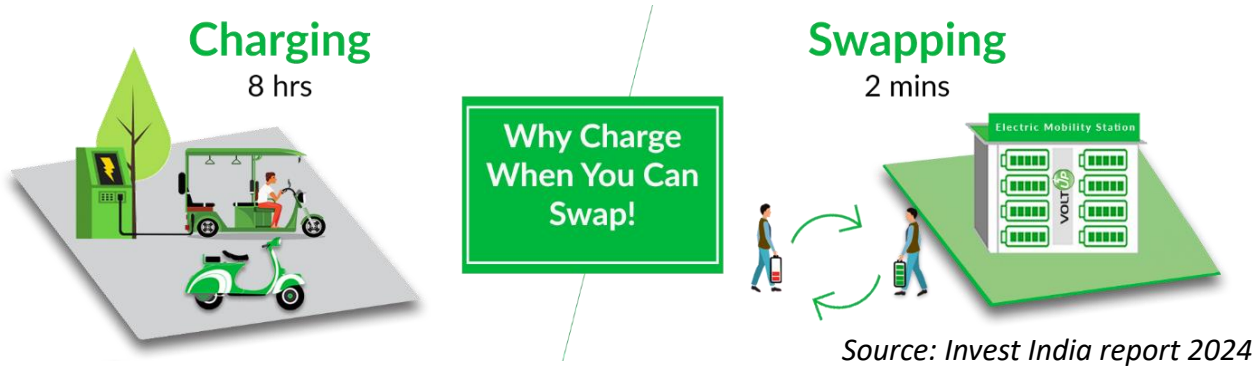


TCO Analysis for E3W (5 years Life Cycle)



Conventional Charging Vs Battery Swapping

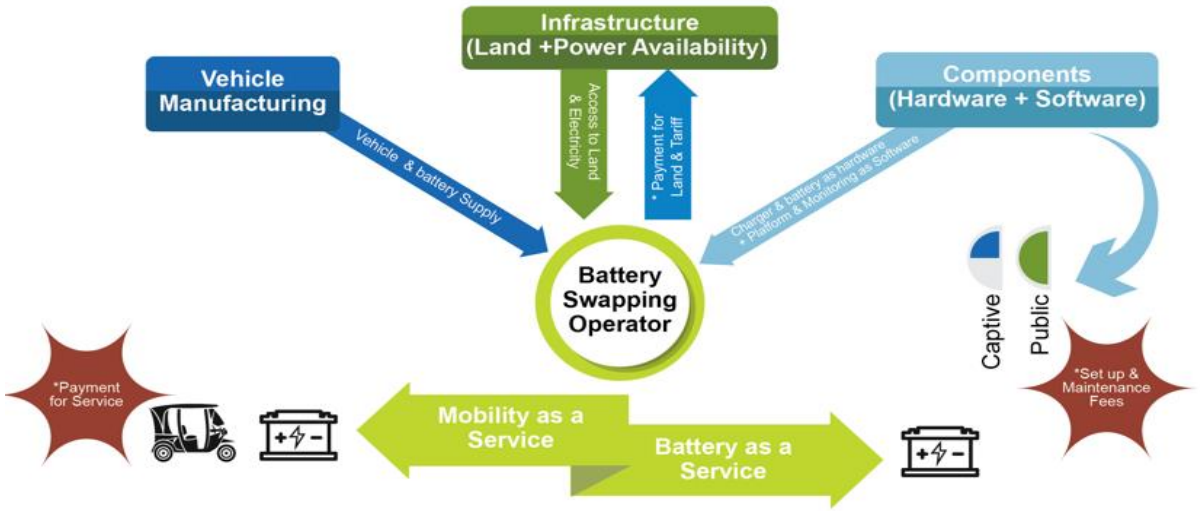
Criteria	Conventional Charging	Battery Swapping
Refueling Time	4-8 hrs (Slow)	2-4 min (Fast)
Ease of Use	Convenient for home charging, but slower in public	Simple and fast for commercial fleets
Battery Ownership	Customer owns battery	OEM owns battery, leased to customer
Adoption and Flexibility	More flexible, common for personal E2W, E3W, E4W etc	Best for high-usage vehicles like last mile operators E2W, E3W and E-trucks etc
Charging Tariff	Lower for the units consumed for charging	Higher but only charged for the differential units



Source: Invest India report 2024

Potential Opportunity In India for Stakeholders

Battery Swapping Business Ecosystem



MONETIZATION

Land Owner	Software Provider	Battery Swapping Operator
• Revenue through renting and leasing • Revenue sharing or franchise model (to ease Capex of BSO)	• Revenue Sharing through Subscription fees • Revenue sharing model with BSO/OEM	• Revenue through per swap or kWh basis as per use • Offered service as per subscription/franchise model

Source: Invest India report 2023

Scalable Battery Swapping Business Model

Mobility	Infrastructure	Components
Partnership Between Auto OEM & BSO SUN MOBILITY	Land (Leasing or Renting) & Revenue Sharing TATA POWER-DDL	Hardware Outsourcing In House development EXICOM POWER SOLUTIONS
Retrofitting of Existing non EV RACE energy	Power Sourcing above 100kWOpen Acess or Captive or Local Discom adani Electricity	Software Subscription In House Platform Numocity
Retrofitting of Existing non EV YUMA		

Pic Courtesy: Battery Smart station Janakpuri

Pic Courtesy: Sun Mobility station Azadpur

Conclusion or Key Takeaways

Requirements of Collaborative Efforts in Battery Swapping Industry

- **Strategic Partnerships:** **Battery Swapping Operators (BSOs)** are collaborating with **Distribution Companies (Discoms)**, **OEMs**, and **aggregators** to create a unified battery swapping ecosystem, improving efficiency and resource sharing.
- **Innovative Business Models:** Integration of **Infrastructure as a Service (IaaS)**, **Battery as a Service (BaaS)**, and **Software as a Service (SaaS)** provides scalable solutions, enhancing service delivery and affordability.
- **Adaptability:** Allowing **flexible battery sizes**, **different chemistry and modular design.**
- **Scalability:** Accommodating additional compartment for expansion, framing in **transport hub, municipal parking and societies.**
- **Innovation:** Encouragement to **passenger & commercial vehicle** segment to improve business sustainability and logistic efficiency. **E-buses and E-trucks** to be game changer for Indian Market

Key Takeaways from Swapping Infrastructure & PM drive Policy

- **Private/Captive Swapping station** are identified and recognized to be provided with **EV tariff meter** and eligible for **Subsidies & Incentives**.
- Ministry has put step forward towards **standardization** and **localization** of the **battery** and **interchanging station**. However, there is no such standardization norms for battery packs or compartments.
- No mandate for the **service charges limits on** private/captive stations to encourage more BSO and improve business viability.
- Up to **2000 Cr.** To be allotted for **EVCI under PM drive** which cane be a greater push for BSO to collaborate with Govt. agencies and deploy more swap station and increase viability of the business
- The **Battery-to-Grid concept** allows stored energy from batteries to be fed back into the grid when needed or when the batteries are not being used for extended periods. Another business opportunity for BSO to evaluate with Discom & Industrial area.

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THANK YOU

For discussions/suggestions/queries email: ***isuw@isuw.in***

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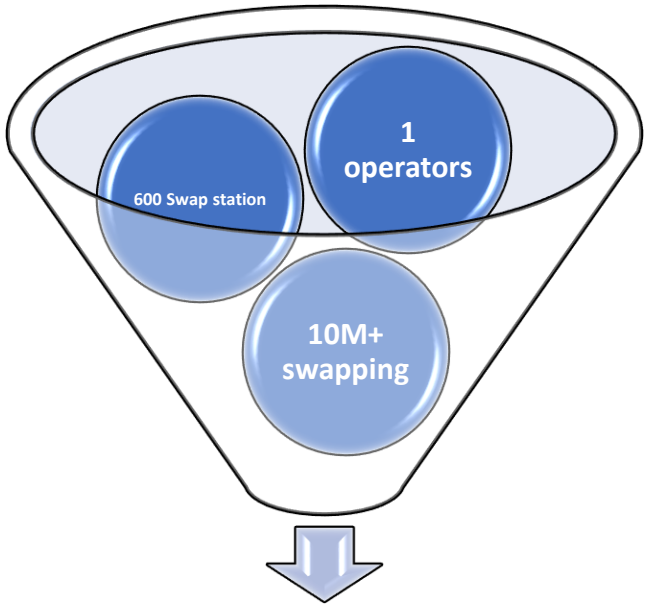
File for Assumptions considered & References:

Microsoft Edge PDF Document

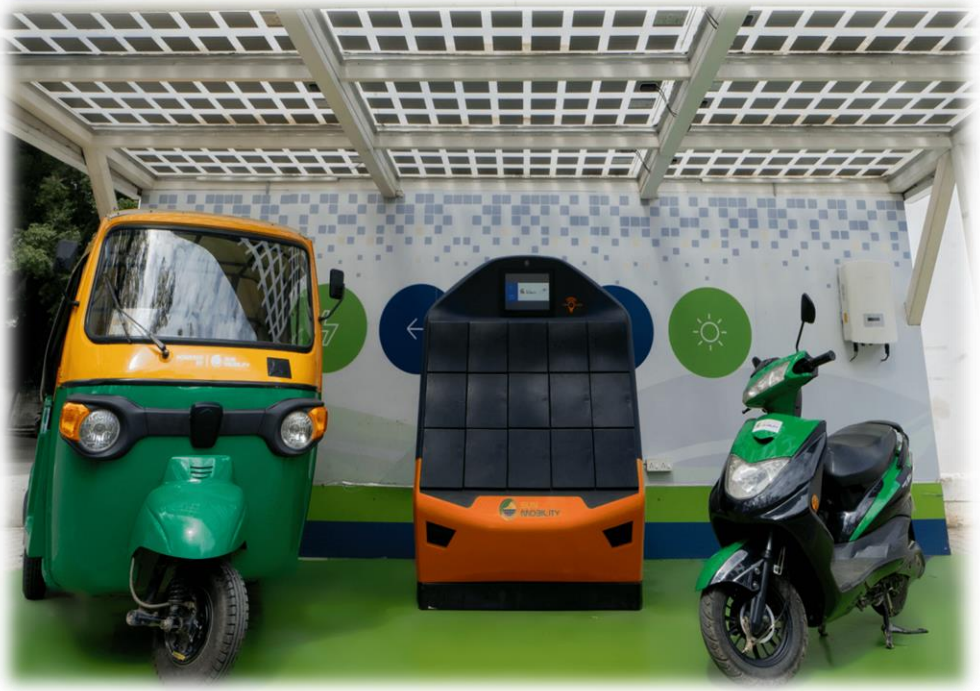
Case Study- Sun Mobility

- 1.68 to 2.16 kWh- Single battery Rack (14 nos), 20% spare batteries for additional interchange
- 48V25Ah-48V45Ah Battery Pack, 92% efficiency
- 3 Ph,415V, 30.24kW, 92% efficiency, 15 dock smart interchanging station
- 120-130 Batteries dispense in 16hrs of a operations in a day
- Charging time per battery avg. around 1- 1.5 hrs a battery
- Sale of per unit price is INR 34/kWh & Avg. purchase rate of per unit price is INR 4.5 per unit from TPDDL.
- No. of vehicles (E2W/E3W) swap batteries at one swapping station avg. around 70-80 nos.
- Avg. range of E2W- 60km and E3W-100km
- Avg. Cost of leasing land is INR 100-150 Rs. Per sq ft.



Revenue of INR $6+ Million

(FY 22-23)



Upcoming Heavy Duty Swapable Fleets in 2025