**Replication Case: Freetown, Sierra Leone**

The objective of this Call for Proposals is to support early deployment and testing of Battery Swap Charging Infrastructure for light EVs in Freetown Sierra Leone. This will complement the ongoing E-mobility project in Sierra Leone funded by the Global Environmental Facility (GEF). The project is supporting strategy and policy development, a demonstration of electric 3-Wheeler fleets, charging infrastructure deployment and management of the end of life of EV batteries. More information on the project here: <https://www.thegef.org/projects-operations/projects/10273>.

This SOLUTIONSplus project will make available up to **EUR 30,000** for selected private entities (including start-ups), NGOs, research institutions active in electric mobility and able to provide services via innovative battery swapping and charging systems for light EVs to drive their adoption in Sierra Leone. Extra points will be awarded if the offered battery swapping and charging system is integrated with a solar energy system (in off-grid or grid-tied mode) to be able to study joint performance of RE, EVs and swap batteries and form a scalable energy transition model for Sierra Leone.

This system through SOLUTIONSplus should be compatible with the e-Kekes procured through the GEF project (detailed specifications below). The entity will be responsible to fully own, operate and manage the solar and battery swapping and charging system and interface appropriately with EV fleet provider (or also play this role) for seamless and sustainable light EV fleet and Charging business.

**Technical Specifications:**

Below are Technical specifications for ongoing GEF project in Sierra Leone for e-Kekes to be run with battery swap charging station.

**Electric 3-Wheeler (e-Keke)**

|  |  |  |
| --- | --- | --- |
| **Specifications** | **Unit** | **Description** |
| Vehicle Category |  | L5M[[1]](#footnote-1) |
| Operational Hours[[2]](#footnote-2) | Hours | 12 – 16 |
| Seating Capacity | # | D+3 |
| Minimum Gradeability | % | 15 |
| Minimum Speed | kph | 45 |
| Running kms per day[[3]](#footnote-3) | kms/day | 80+ |
| Minimum Range per Full-swap | kms/swap | 40 |
| Minimum Vehicle Warranty | Years | km | 5 years | 100,000 km |
| Other Requirements |  | Adhering to [European](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R0168) / [Indian](https://morth.nic.in/sites/default/files/ASI/6-AIS-177-Type%20Approval%20Requirement%20for%20vehicle%20of%20category.pdf) requirements for L5 category vehicles |

**Swappable Batteries**

| **Specifications** | **Unit** | **Description** |
| --- | --- | --- |
| Battery Single Module Weight | kg | Not more than 25kg |
| Total Vehicle-pack Capacity | kWh | ≥ 4 kWh minimum useful capacity[[4]](#footnote-4) |
| System Voltage | V | ≤ 60 V (Low voltage DC system) |
| Operating Temperature Range | Deg C | 10 – 55 |
| Thermal Management |  | As appropriate to meet the safety requirements as per [EU Regulation 100](https://op.europa.eu/en/publication-detail/-/publication/f7a1317b-df64-49d5-a1d5-efa800dfba02/language-en) / [AIS-156-2020](https://hmr.araiindia.com/api/AISFiles/AIS_156_with_Amd%201%20to%204_6ebb716e-314a-4ef6-bda9-cfd0361de781.pdf) |
| Connector Type |  | IP67 and other requirements as per [EU Regulation 100](https://op.europa.eu/en/publication-detail/-/publication/f7a1317b-df64-49d5-a1d5-efa800dfba02/language-en) / [AIS-156-2020](https://hmr.araiindia.com/api/AISFiles/AIS_156_with_Amd%201%20to%204_6ebb716e-314a-4ef6-bda9-cfd0361de781.pdf) |
| Theft Prevention |  | Secure locks for battery and vehicle, Geo-fencing recommended for Swap Battery |
| Ingress Protection |  | IP67 (for battery and motor) |
| Safety Standard |  | [IEC 62660](https://webstore.iec.ch/publication/28965), [SAE J2929](https://batterystandards.info/standard/sae-j2929), [SAE J2464](https://webstore.ansi.org/standards/sae/sae24642009j2464), [IEC 62281](https://webstore.iec.ch/publication/61994) |

**Battery Swap Charging Station**

|  |  |  |
| --- | --- | --- |
| **Specifications** | **Unit** | **Battery Swapping Station** |
| Swap Time | Minutes | 3 - 5 mins |
| Thermal Management |  | As appropriate to meet the safety requirements as per [EU Regulation 100](https://op.europa.eu/en/publication-detail/-/publication/f7a1317b-df64-49d5-a1d5-efa800dfba02/language-en) / [AIS-156-2020](https://hmr.araiindia.com/api/AISFiles/AIS_156_with_Amd%201%20to%204_6ebb716e-314a-4ef6-bda9-cfd0361de781.pdf) |
| AC Input |  | 230V, 50 Hz |
| Operating Temperature Range | Deg C | 10 – 55 |
| Operating Humidity Range | % | 5% – 95% |
| Ingress Protection |  | IP54 or better (Battery Swapping station to be raised by 1m platform height for protection in flooding) |
| Safety |  | Water Wading safe up to 200mm, Fire detection & Suppression, Video surveillance [IEC 61851](https://webstore.iec.ch/publication/33644) (EV Charging)  [SAE J3068](https://www.sae.org/standards/content/j3068_201804/)  [IEC 60364](https://webstore.iec.ch/preview/info_iec60364-1%7Bed5.0%7Den_d.pdf) (Electrical Installations) |
| Charging Management System (CMS) |  | Integrated CMS with mobile App for EV users for identification of available charge point, payment gateway and managing user accounts. Smart features and controls for swap operator. |
| **AC Input:** | | |
| Voltage Regulation | V | -0.5 x Vnom to +1.25 x Vnom |
| Frequency Regulation | Hz | 45 – 66 |
| Current Total Harmonic Distortion (CTHD) | % | 0% – 10% |
| Voltage Total Harmonic Distortion (VTHD) | % | 0% – 5% |
| Power Factor |  | ≥ 0.95 (throughout operational range) |
| Input Protection |  | Self upto 420VAC Line & Neutral input fuses  Circuit breakers and Manual overrides as appropriate |

1. L5 = electric motor > 250 W, Max. Speed > 25 kph, M = Passenger vehicle [↑](#footnote-ref-1)
2. Hours for which vehicle should be available on road (this is excluding charging time) [↑](#footnote-ref-2)
3. Real world energy consumption estimated to be 80-100 Wh/km [↑](#footnote-ref-3)
4. Useful capacity is after discounting Depth of Discharge (DoD) [↑](#footnote-ref-4)