Cell Propulsion

Retrofitted EVs: Status, Potential & Challenges
About Us

- Mobility technology company developing powertrain components, integrated electric powertrains for electric commercial vehicles (LCVs, HCVs, etc) & 4W, and connectivity modules for vehicle IoT.

- 30 member engineering team working out of a leased 20,000 sq ft facility located at Bommasandra, Bangalore.

- Commercialized BMS, Motor Drives, Chargers, and Connectivity modules for low voltage (48V - 96V) light electric vehicles.

- Scaling up our offerings for high voltage, high power (600V, 100kW) heavy commercial vehicles.
The Core Team

Nakul Kukar
Co-founder & CEO; 7 years experience @ISRO with vehicle engines and electric aircrafts.

Paras Kaushal
Co-founder & COO; 6 years experience @ISRO with engine ignition systems, Thermal & energy storage systems

Supratim Naskar
CTO; 7 years experience @ISRO with Launch Vehicle Structures, Spacecraft Mechanisms & Space Robotics
Status of EV retrofit market in India

- EV Retrofit supplementary to new EV production.
- Highly nascent with lots of policy ambiguity at both national and state level.
- Lower barrier to entry compared to new vehicle production due to clarity on technology landscape and certification requirements.
- Addressable Market potential of more than 100 billion USD for conversion of HCVs to electric.
Major Problems addressed by EV Conversion Technology

- Lack of *indigenous technology* for developing EV components adapted for Indian (tropical) climate conditions
- Low availability of *customized* EV components at required voltages, power ratings, and price
- Expensive *pricing* of new EVs.
- Lack of *awareness* among customers about EVs leading to lack of commitment to transition to fully electric fleets.
Cell Propulsion is developing powertrain components for electric commercial vehicles

- **Elements of a Powertrain:**
  - **Hardware:** Electric motors, motor drives circuit board, battery packs, BMS circuit board, Charger Circuit board, Connectivity Module
  - **Software:** Motor Controller firmware, BMS Firmware, Charger firmware, Connectivity software stack, and Operating software layer.

- The operating software integrates all the individual components into an intelligent system called powertrain which drives the vehicles and delivers required performance.
Technical & economic viability of EV retrofitting in India

- AIS-123 and our products described above give us ample confidence on the technical feasibility of converting vehicles to electric.
- Efforts required to make this commercially viable.
- Need to devise unique business models to drive adoption for EV retrofitting - Revitalization of classic cars, creation of a “pre-owned EV” market/platform, etc.
- Lack of subsidy under FAME-2 for EV retrofitting a major deterrent to achieve cost parity with new ICE Vehicles.
Our Solution

Cell Propulsion is developing integrated powertrains for retrofitting of electric buses.

<table>
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<tr>
<th>e-Bus (12m, 16ton) Powertrain Specifications</th>
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<tbody>
<tr>
<td>Nominal Power</td>
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<tr>
<td>Peak Power</td>
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<td>Operating Voltage</td>
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| Battery Capacity and Range                    | 125kW-hr for 150km  
200kW-hr for 200km  
250kW-hr for 250km |
| Battery Cycle Life                            | 5000 at 0.8C max Charge and 1C max Discharge |
| Top Speed                                     | 80 km/hr |
Potential & challenges in retrofitting of Buses

- Number of buses on Indian roads to increase from current 1.5 million to 3 million by 2030.
- Over next 3-4 decades, all of these have to be replaced/ upgraded to electric.
- Only a mix of new eBuses supplemented by retrofitted Buses can meet this demand.
- Local production/supply chain of cells, advanced electric motors, and cost are the major challenges for large scale conversion of Buses to electric.
- In long term, major technological improvements are also required to enable electrification of long distance inter-city buses.
Thank You