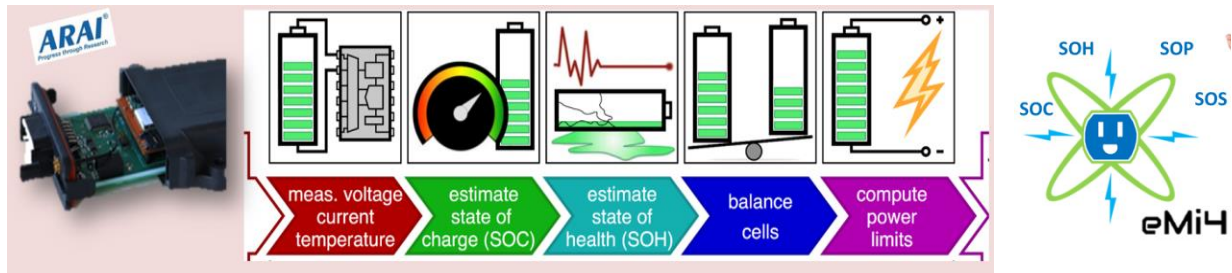


# Electric Vehicle Battery Management System (EV-BMS)



## Technology

- Electric Vehicle Battery Management System (EV-BMS) Hardware and Software suitable for Indian conditions
- Technology Readiness Level - TRL8 (Actual system completed and qualified test and demo operational environment)

## Features

- Software development using Model Based Design (MBD) approach
- Monitoring of every cell Voltage , pack current and temperature
- Cell balancing (Passive)
- Advanced Estimation Techniques for State of Charge (SoC) and State of Health (SoH)
- Advanced Estimation Techniques for State of Power (SoP) and State of Safety (SoS)
- Active Monitoring and Derating
- Thermal Management
- Compatible with wide range of lithium-ion cells
- Failure detection and Diagnostics
- Modular and Scalable Architecture
- State of Art GUI for Monitoring, Configuration and Calibration

## Applications

- Applicable for 2w/3w/4w Electric and Hybrid Electric Vehicles
- Applicable for fuel cell and Ultra capacitor based systems
- Applicable for Energy Storage Systems
- Applicable for Agricultural and Off Road vehicles
- Applicable for Unmanned aerial vehicle (Drones)

## Scale of Validation Achieved

The software package is verified and validated in Model in Loop (MIL). Interface of the control strategy with different type of Battery packs has been tested. This package is MATLAB Simulink based configurable software and its compatibility with general Simulink based plant model is validated. The developed BMS is validated for automotive test compliance of EMI/EMC (Radiated Emission, Radiated Immunity, Conducted Emission, Conducted Immunity) as per AIS 004 Part 3, Electro static Discharge Test and Environmental Tests for Temperature, Humidity and Vibration.

## Intellectual Property

NA

## Abstract

Automotive Research Association of India has developed indigenous and India specific cost effective technology solution for Energy/Battery Management system. This Intelligent energy management system 'ARAI-eMi4' is a complete software and hardware platform comprising of advanced algorithms for energy management and an automotive compliant hardware to interface with the energy source.

The system software and hardware is designed to accommodate a wide range of lithium ion battery chemistries. The algorithm is designed to monitor Current, voltage and temperature of the cells in the battery pack. It further calculates and estimates 4 important states of the energy source (SOC, SOH, SOP, and SOS) using advanced estimation methods. The software and hardware platform so developed is scalable and provides flexibility to end users with master/slave topology, which allows multiple units to be connected together to support up to 800 VDC systems. The hardware is designed with highest levels of safety using automotive-grade components. The UI Platform is equipped with customizable diagnostic software via CAN and serial interface which manages pack diagnostics, data logging, and provides rapid parameter modification and firmware upgrades.

## Beneficiary Industry

- EV-HEV Vehicle Manufacturers of 2w/3w/4w Electric and Hybrid Electric Vehicles
- Energy Storage System providers.
- Engineering Service Providers
- Battery Pack Manufacturers.
- Research Institutes/Academies/Universities working on Energy Storage programs

### **ARAI also offers the following development services in areas of Energy Management.**

- Functional Architecture Development.
- Battery Plant model development
- Control Algorithm development for Energy management.
- Verification and Validation methodologies.
- Consultancy for Battery pack and management system development.
- Developing Algorithms in the areas of Balancing of Ultra capacitors other Energy sources

Also visit <https://emobility.araiindia.com/> for other EV/HEV capabilities of ARAI.