SIMMOL

FAST TRACK TO UNLOCKING STRATEGIC VALUE

THROUGH IN-HOUSE BMS TECHNOLOGY

EXECUTIVE SUMMARY

In the rapidly evolving landscape of electrification and energy storage, OEMs are under growing pressure to differentiate, optimize performance, and reduce cost - all while ensuring long-term resilience and compliance. At the heart of every battery-powered product lies a critical enabler: the Battery Management System (BMS).

Yet, many OEMs continue to rely on third-party BMS solutions - often closed, inflexible, and cost-heavy due to embedded software licensing. This limits their ability to adapt, scale, and innovate.

Licensing and insourcing a proven BMS technology platform changes that. It empowers OEMs with control over the most valuable and complex part of the battery system: the software. By owning the BMS stack, companies gain direct influence over performance, lifecycle optimization, and the user experience. They can deploy proprietary algorithms, tailor strategies to specific chemistries or applications, and integrate BMS data into broader analytics and control systems.

EXECUTIVE SUMMARY

From a shareholder value perspective, this shift unlocks multiple strategic levers:

- Margin Expansion: Reduces recurring royalties and enables BOM optimization at scale.
- Differentiation: Enables product features and UX that stand out in commoditized markets.
- Valuation Upside: Signals technical maturity and IP ownership, increasing investor confidence.
- Risk Mitigation: Reduces dependency on single-source vendors and improves lifecycle control.

In short, in-house BMS capability is not just a technical upgrade - it is a business enabler. It allows OEMs to accelerate innovation, secure supply chains, and fully capture the value they create for customers and shareholders alike.

FACT-BASED BENEFITS OF IN-HOUSE BMS TECHNOLOGY

- IP Control and Differentiation
  - Full control over software and hardware allows OEMs to build differentiated and IP-protected solutions.
- Software is the Core Value Driver
  - The majority of BMS value lies in its software, including algorithms for SoC, SoH, balancing, and safety logic.
  - Off-the-shelf BMS vendors embed the cost of software development into every unit, driving up the product price.
- Customization for Specific Battery Architectures
  - Tailored support for unique cell chemistries, pack geometries, and cooling strategies enhances performance and safety.
- Battery Life and Performance Optimization
  - True optimization of battery lifespan, charging profiles, and energy throughput is only possible with deep control over the BMS software.
  - Allows implementation of proprietary charging strategies, balancing routines, or degradation models.

FACT-BASED BENEFITS OF IN-HOUSE BMS TECHNOLOGY

- Integration with VCU / EMS and System Controllers
  - Easier and cleaner integration with vehicle control systems, energy management platforms, or predictive maintenance services.
- Faster Iteration and Innovation
  - Shortens development cycles and enables fast reaction to field data or customer feedback.
- Regulatory and Functional Safety Compliance
  - Owning the software stack simplifies audits and functional safety validation to ISO 26262, UL 1973, AIS-156, etc.
- Lifecycle Management
  - Enables long-term firmware support without dependencies, platform component re-use across generations, and control over obsolescence.

FACT-BASED BENEFITS OF IN-HOUSE BMS TECHNOLOGY

- Cybersecurity and OTA Capabilities
  - Secure key management, firmware signing, and OTA updates are easier to implement and verify in-house.
- Cost Optimization at Scale
  - Eliminates perpetual license or per-unit fees.
  - Enables lean hardware design with just the required features, avoiding over-specs dictated by third parties.
- Supply Chain Flexibility
  - Enables sourcing hardware from multiple vendors while maintaining a consistent software platform.
- Enhanced Field Diagnostics
  - Access to specific internal telemetry, logs, and software stack improves fault isolation and optimal customer support responsiveness.

STRATEGIC BENEFITS

- Avoiding Vendor Lock-In
  - Eliminates risk of BMS vendors changing business models, pricing, or disappearing from the market.
- Better Margin Control
  - In-house development avoids double-markups and allows OEMs to capture more of the product value chain.
- Internal Capability Building
  - Fosters a knowledge-rich engineering team and builds long-term competitive advantage in battery-centric design.
- Readiness for AI and Data-Driven Enhancements
  - Proprietary software stack becomes a foundation for integrating edge analytics, ML-based SoH estimation, and adaptive algorithms.

STRATEGIC BENEFITS

- Strategic Technology Positioning
  - A proprietary BMS platform forms the foundation for battery intelligence, digital twins, and AI-enhanced lifecycle tools.
- Investor and Market Perception
  - In-house BMS capability signals technical depth, strategic autonomy, and IP leverage - important for valuation.
- Customer Trust and Brand Identity
  - OEMs with in-house BMS can better control end-user experience, diagnostics, and reliability expectations.
- Customization as a Differentiator
  - Ability to offer tailored features per customer segment or application niche (e.g., fast-charging fleets vs. long-life ESS).

STRATEGY QUANTIFIED
DYNAMIC OPERATIONAL BOUNDARIES

- Dynamic operational boundaries: Every BMS ensure the battery stays within the safety window of voltage, current, temperature, etc… But dynamic operational boundaries are the key to strategic battery lifecycle management - they bridge the gap between chemistry limits and application demands.
  - Examples are charge limit to 80% SOC, adaptive SOC limit, DOD limit, limit fast charge current in cold weather, operational temperature window, geofenced parameters, etc…
- Using the BMS not just as a safety device but as a battery longevity optimizer justifies a more sophisticated, insourced BMS strategy.
  - These boundaries can be dynamically adjusted per application (e.g., urban vs. highway traffic) and even over time (adaptive BMS strategies).
- These boundaries also allow for differentiated warranty strategies, e.g., guaranteeing longer pack life under tighter constraints for high-value customers.
  - Application-based optimization can increase battery life by 200%.

STRATEGY QUANTIFIED FAST CHARGING

- Cell Chemistry-Specific Optimization: Different chemistries (e.g., LFP, NMC, LTO) respond differently to high C-rates. An OEM-owned BMS allows for custom profiles that match the exact chemistry and application.
- Pre-conditioning Logic: Efficient fast charging often requires pre-heating or cooling the pack to a target temperature range. This orchestration between the thermal system and charger requires tight BMS control.
- Charge Curve Shaping: Fast charging isn't just about pushing high current. It's about shaping the voltage and current curve to minimize degradation - this logic lives in the BMS.
- Charger Communication (DC fast charging standards): Full control over protocol layers (e.g., ISO 15118, CHAdeMO, GB/T, CCS) and the ability to respond to charger-side requests is much easier with an insourced, modifiable BMS.

STRATEGY QUANTIFIED
OTHER ITEMS

- 800V drivetrain: Supporting high-voltage safety, precision, and performance through complete system integration and control.
- Standardisation across vehicles – one platform and software stack for all vehicles with strongly reduced supplier & licensing overhead. Saves on certification, ensures fleet-wide data consistency and streamlines after-sales service.

THE SIMMOL OFFERING

THE SIMMOL BMS PLATFORM

- Hardware boards
  - Each application has its own board
- Firmware core
  - Mathlab-Simulink-based development with direct compilation to the selected processor
  - Developed ground-up with functional safety in mind
- Software solutions
  - iOS & Android App
  - Windows application
- Telemetry and data analytics
  - Not included, partner recommendations available

LOW VOLTAGE PLATFORM VARIANTS

Name	Features
LV	6-16S, 100mA bal., 70V_{max}, 6x°t, Flash 256Mb, EEPROM 256Mb, isoCAN, CAN, BT5.1, 2x A.I., 6x D.I., 7 D.O., PWM, HVIL, RTC w.o. Bat
PDU80V	Hall or Shunt, 80V_{max}, Mosfet (100A, 150A@20s), no heatsink required

Name	Features
Telecom	6-16S, 100mA bal., 70V_{max}, 6x°t, Flash 256Mb, EEPROM 256Mb, SD 32Gb, isoCAN, RS485, RS232, I2C, BT5.1, 2x A.I., 4x D.I., 7x D.O., HVIL, 2x SPST relays, RTC w. Bat, 8x LED, Buzzer, charge current limiter, Mosfet (100A, 150A@20s), no heatsink required

LOW VOLTAGE AUTOMOTIVE PLATFORM VARIANTS

Name	Features
ALV (1 AFE)	1 AFE: 6-16S, 200mA/300mA bal., 70V_{max}, 6x°t, Flash 256Mb, EEPROM 256Mb, SD 32Gb, isoCAN, CAN, BT5.1, 6x A.I., 6x D.I., 7x D.O., HVIL, RTC w. Bat, ISO26262-C
ALV (2 AFE)	2 AFE: 6-25S, 200mA/300mA bal., 110V_{max}, 15x°t, Flash 256Mb, EEPROM 256Mb, SD 32Gb, isoCAN, CAN, BT5.1, 6x A.I., 6x D.I., 7x D.O., HVIL, RTC w. Bat, ISO26262-C
PDU80V	Hall or Shunt, 80V_{max}, Mosfet (100A, 150A@20s), no heatsink required
PDU110V	Hall or Shunt, 110V_{max}, Mosfet (100A, 150A@20s), no heatsink required
PDUC	Contactor interface

HIGH VOLTAGE PLATFORM VARIANTS

Name	Features
HV BESS	6-36V_{IN}, 1500V_{max}, isolation measurement, 5x°t, Flash 512Mb, EEPROM 256Mb, SD 32Gb, 3x isoCAN, Modbus RS485, I2C, BT5.1, 2x A.I., 1iso+4x D.I., 1iso+4x D.O., 2x HVIL, 4x TPL, RTC w. Bat, 8x 2A relay driver, 8x relay adhesion detection
HV BMU18S	7-18S, 5x°t, 300mA bal.
HV BMU36S	7-36S, 5-8x°t, 300mA bal.
HV BMU72S	7-72S, 5-15x°t, 300mA bal.

HIGH VOLTAGE AUTOMOTIVE PLATFORM VARIANTS

Name	Features
AHV BCU All-in-one	Dual processor, 6-36V_{IN}, 6-112S, 5+5-30x°t, 300mA bal., 800V_{max}, 6MΩ isolation measurement, Flash 256Mb, EEPROM 256Mb, 3x isoCAN, BT5.1, 2x A.I., 5x D.I., 5x D.O., HVIL, 1x TPL, 2x 1000V line voltage measurement, RTC w. Bat, 2x Hal or Shunt 500A, 8x 2A relay driver, 8x relay adhesion detection

Name	Features
AHV BCU Master-Slave	Dual processor, 6-36V_{IN}, 5x°t, 6MΩ isolation measurement, Flash 256Mb, EEPROM 256Mb, 3x isoCAN, BT5.1, 2x A.I., 5x D.I., 5x D.O., HVIL, 1x TPL, 2x 1000V line voltage measurement, RTC w. Bat, 2x Hal or Shunt 500A, 8x 2A relay driver, 8x relay adhesion detection
AHV BMU14S	7-14S, 5x°t, 300mA bal.
AHV BMU28S	7-28S, 10x°t, 300mA bal.
AHV BMU56S	7-56S, 20x°t, 300mA bal.

THANK YOU