



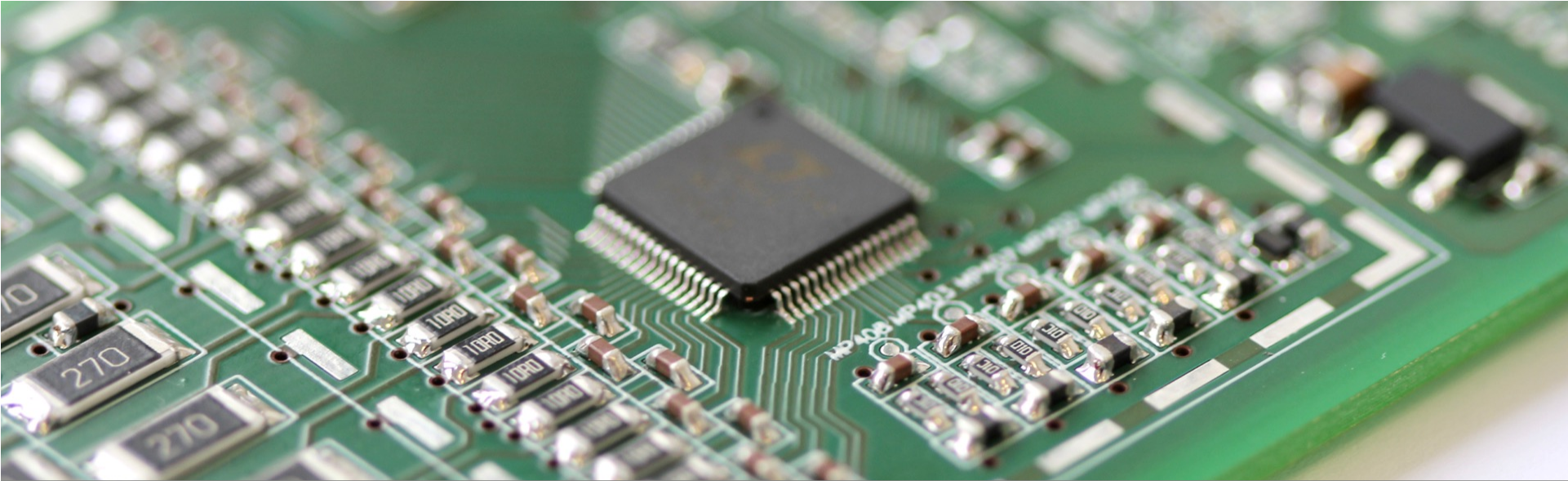
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## LIGHT Battery

without any cables, absolutely safe  
and highly cost competitive

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## Vision & Mission



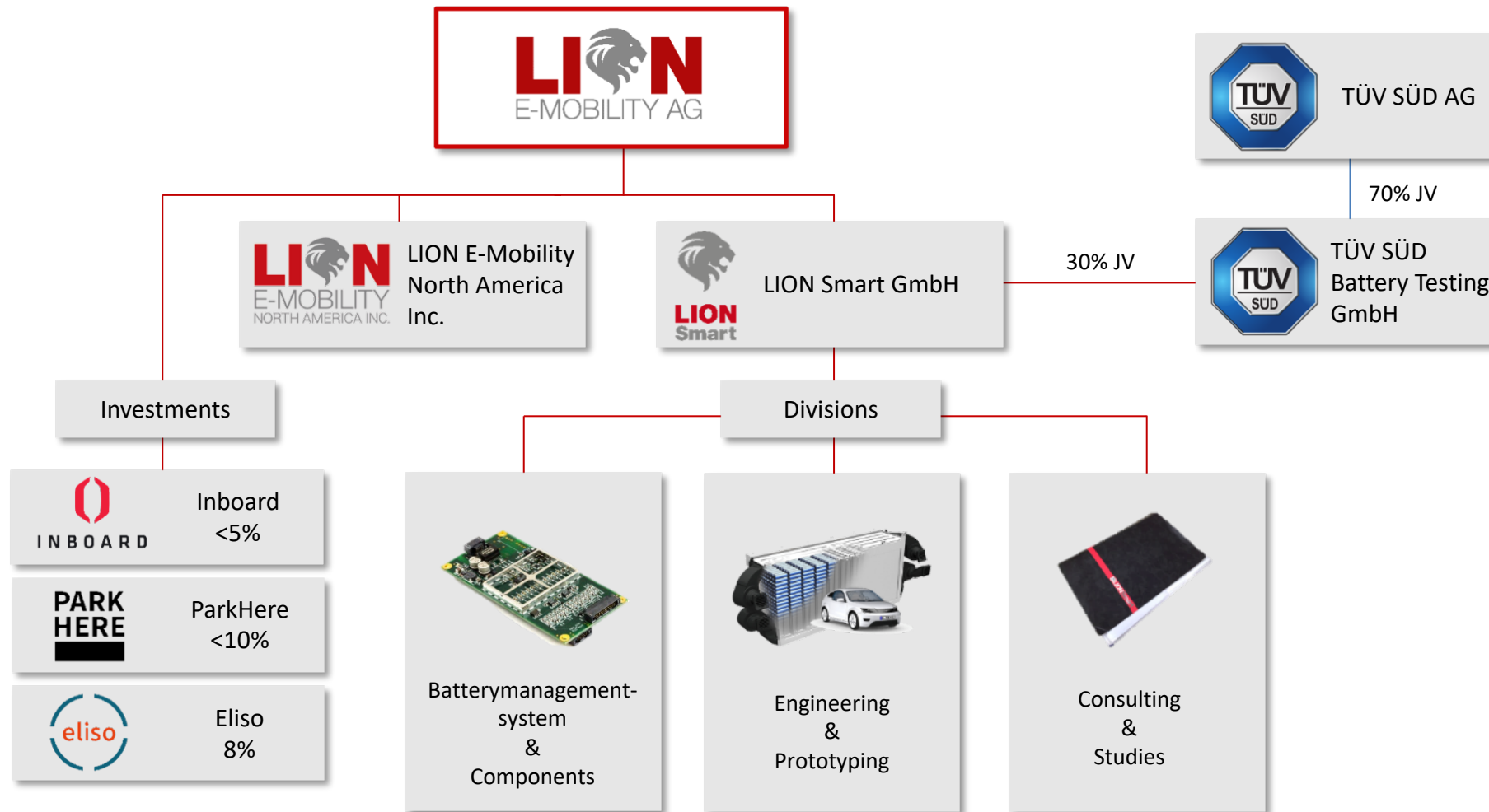
VISION

We electrify the future!

MISSION

Successfully overcome challenges of energy storage applications

# Corporate Structure & Business Segments



## Open BMS and Wireless BMS



Open BMS and Wireless BMS are results of a long lasting collaboration between ADI/Linear and LION Smart

# Open Battery Management System

- Adaptable monitoring system for all types and sizes of lithium-based battery packs
- Modular design of the hardware and software architecture
- Filling the gap between low-tech/low-cost and high-end proprietary systems
- Automatic data acquisition, remote monitoring and cloud based data processing/analytics service
- Flexible framework for scalable battery systems (12 cells per LMM, 16 LMM per LCM)
- Server based data logging and age tracking
- Modular Software Approach



BMW i3 with Wireless DUST BMS in cooperation with LINEAR Technology



Battery Management System



"Mavero" - stationary system of Kreisel



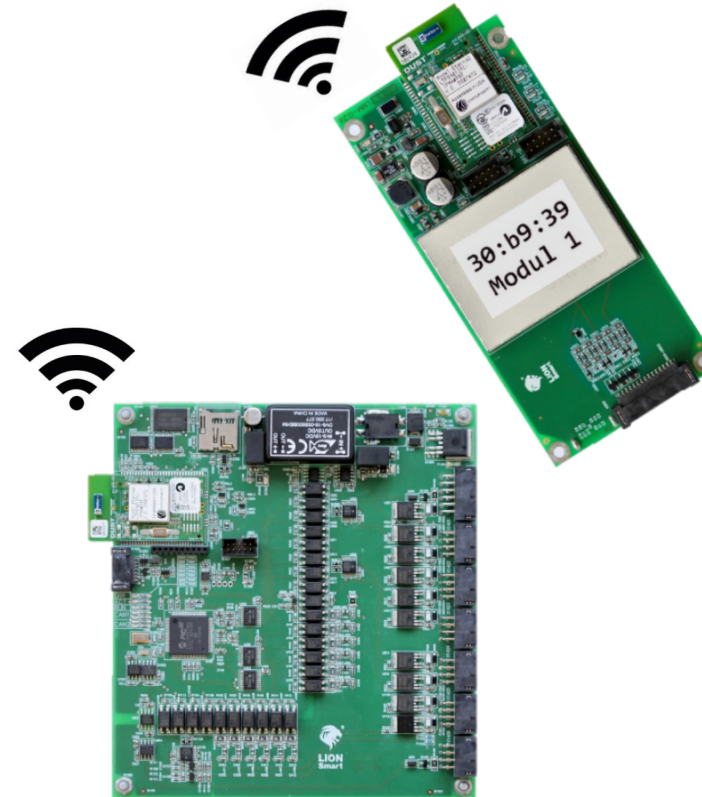
# Wireless Open Battery Management System

## Features of the wireless BMS

- More reliability due to cable/connector elimination
- Enables more flexible placement of battery modules
- Reduces wiring complexity
- Saves transformers and connectors
- Easier to assemble and test due to wireless technology
- Improved battery model execution due to time stamp data

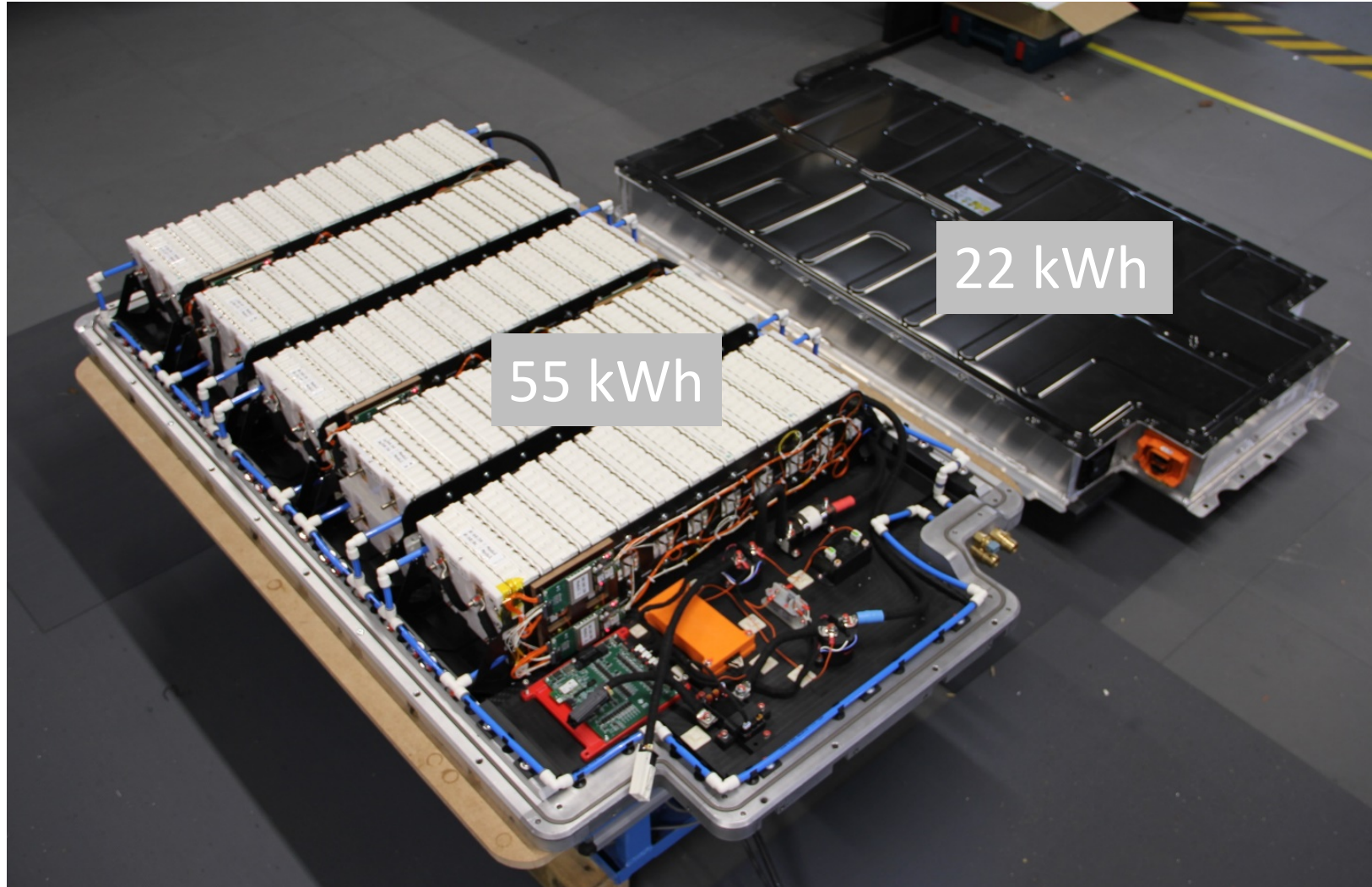
## Future benefits

- Lower costs compared to present system
- Smart production



**Wireless technology promises to significantly improve reliability and simplify the design of automotive battery management systems**

## Wireless BMS i3 Battery Pack





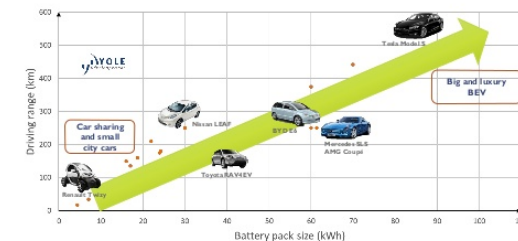
## Wireless BMS i3 at Electronic Show 2016





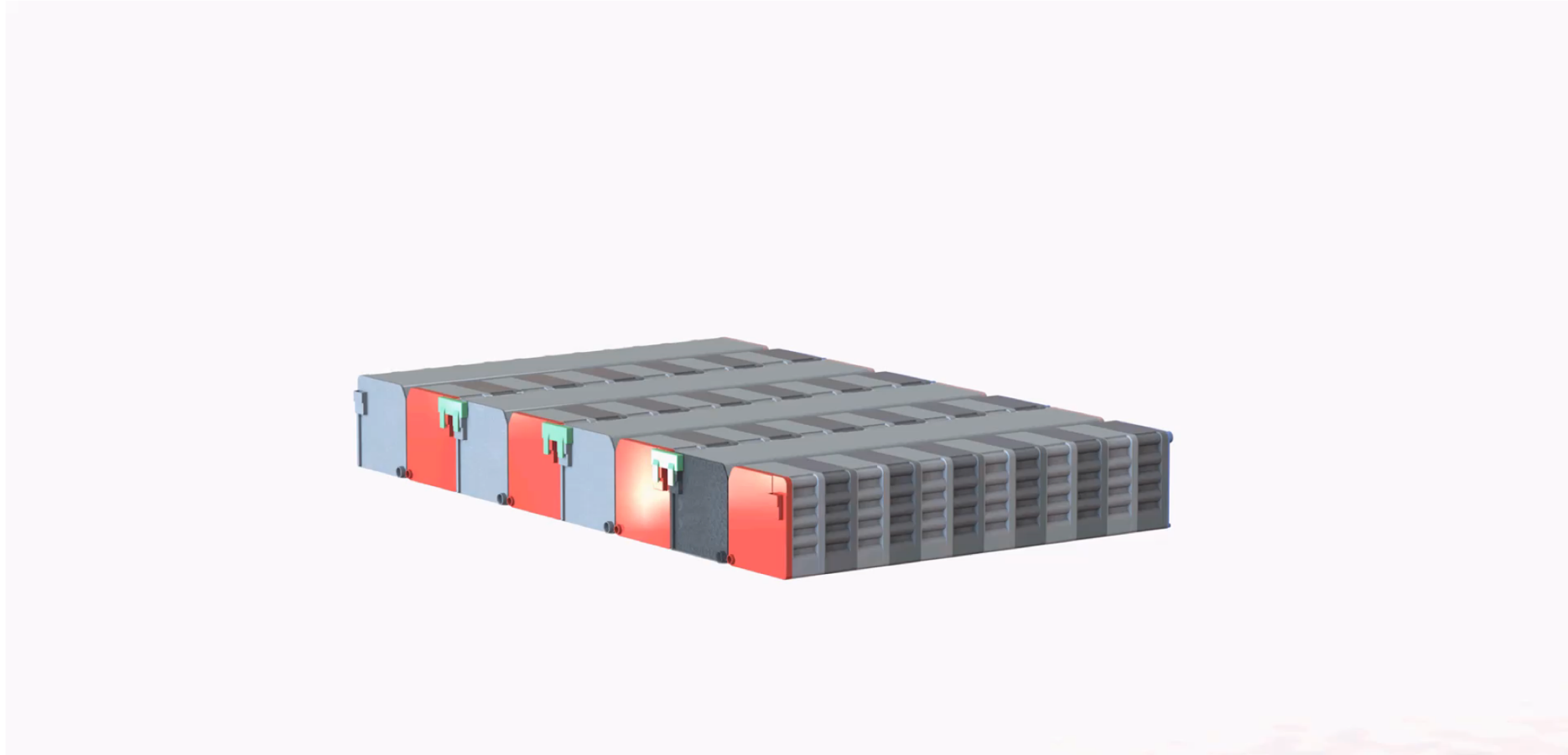
# Challenge for successful battery concepts

- Low cost, high quality solution
- Fully automated high speed production
- Absolutely safe: Fairlure tolerant design, single cell fusing, extinguishing concept
- Best energy density for highest capacity, best range
- Fast charging capability-> Optimal thermal management



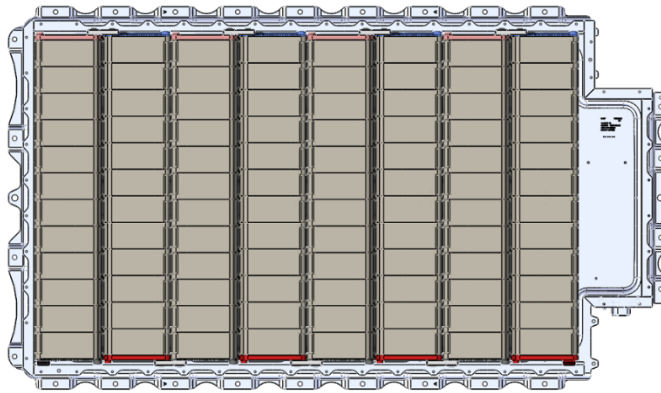
# The **LIGHT** Battery Concept

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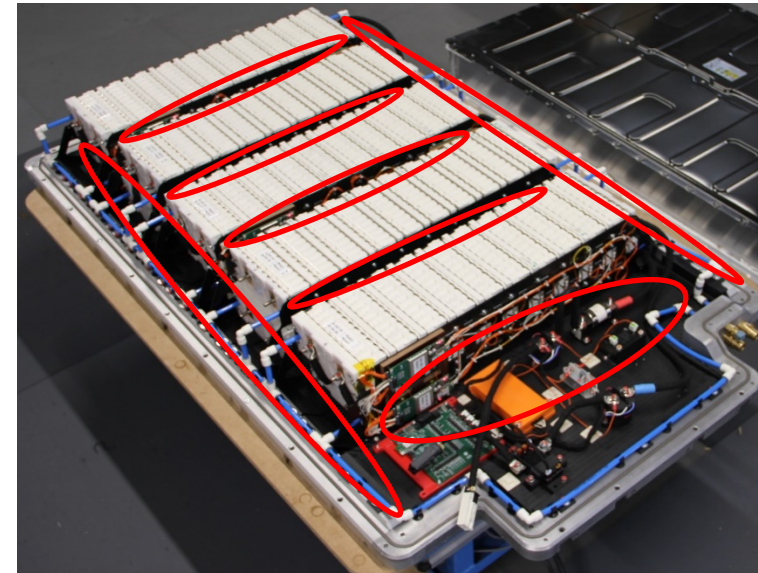


## Wireless BMS i3 Battery Pack (still significant unused space)

**LIGHT** Battery Concept  
**94 kWh** (96s78p 3,5Ah LG 18650 Cells)



Wireless i3 with Kreisel Battery Modules  
**55 kWh** (100s46p 3,3Ah 18650 Cells)



**In comparison to BMW:**

BMW Gen 3 i3 Battery (approx. 2019)

BMW Gen 2 i3 Battery (2017)

**42 kWh** (120Ah Samsung Prismatic cells)

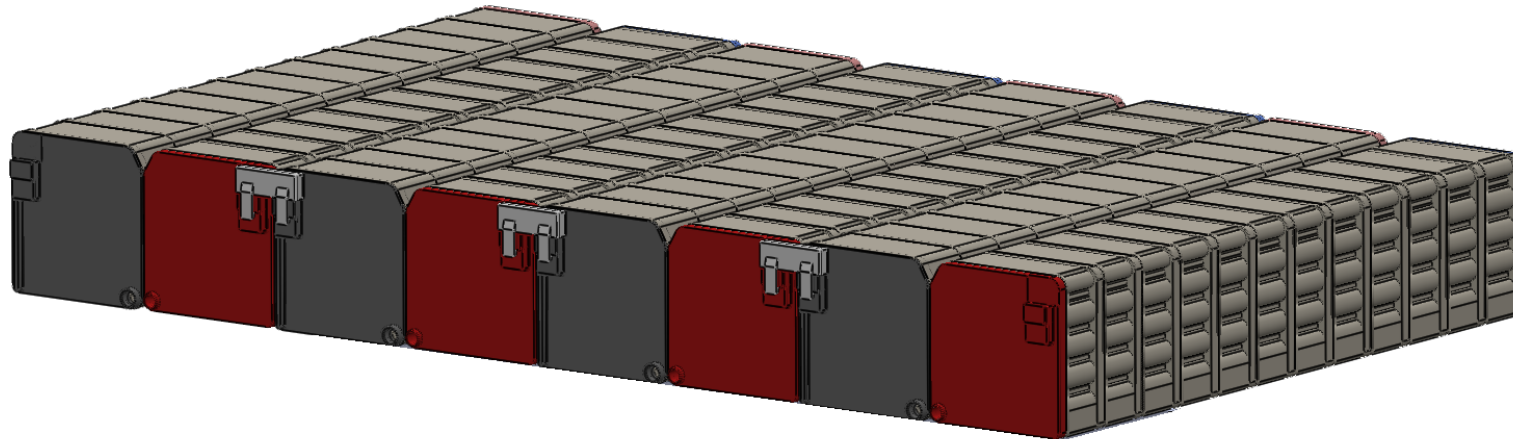
**32 kWh** (92Ah Samsung Prismatic cells)

# The **LIGHT** Battery Concept

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## Specifications

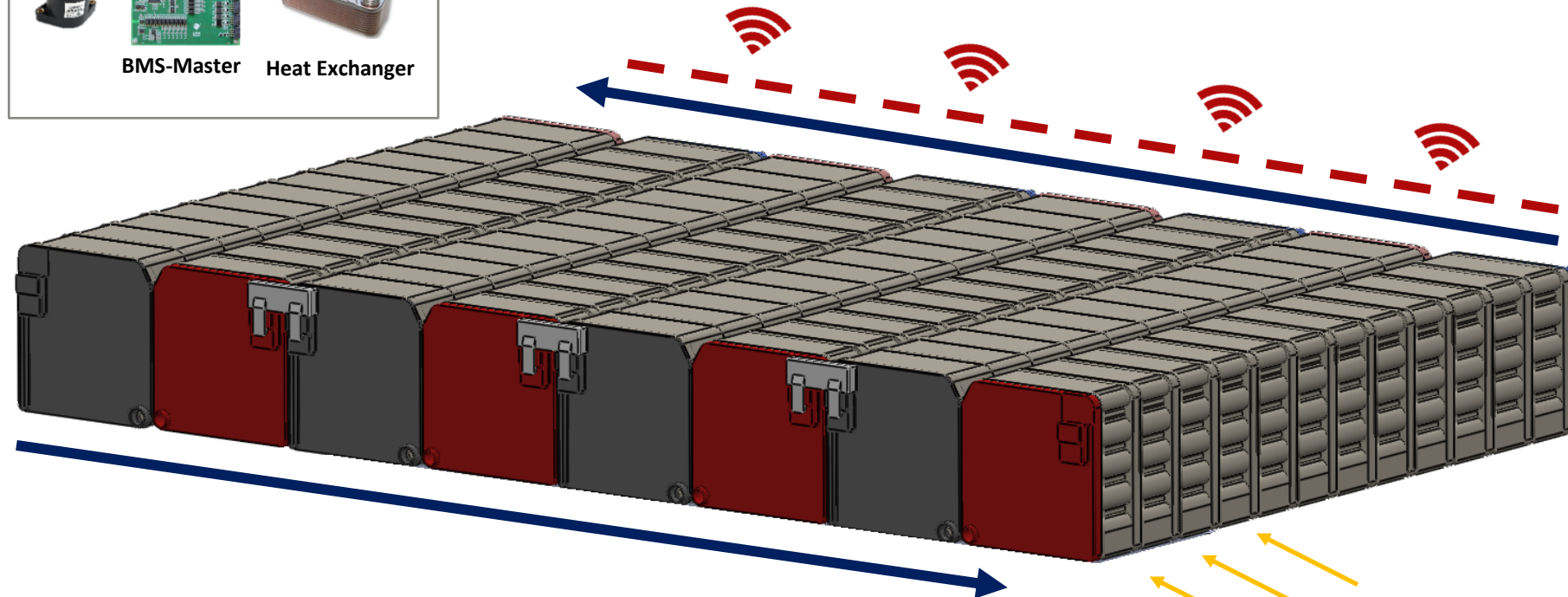
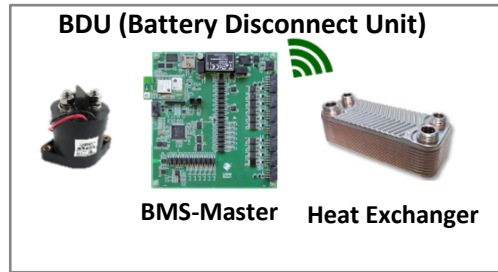
- Battery configuration: 96s78p equals 7488 cells with 18650 format
- Electrical parameters: 345V 273Ah 94kWh
- Mechanical parameters: 475kg
- Expected Range: 700km / 430miles
- Expected Charging Speed: 150kW equals 1000kph / 600mph








# The **LIGHT** Battery Concept

## Functionality

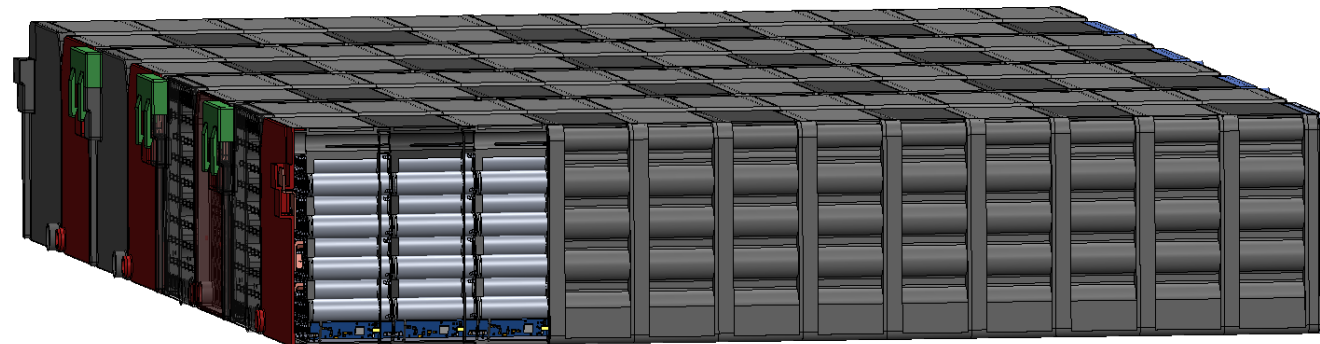


-  Symmetrical flow of cooling liquid around fully immersed cells
-  Wireless module to module communication
-  Immersed single cell BMS communicates optically through the cooling liquid

# The **LIGHT** Battery Concept

## Technical Highlights

- No wires in the whole battery stack
- Smallest part count for battery stack in the industry (<12 different parts)
- Designed for a complete automated production process for battery stack
- Data transmission through the battery via ultrasound and IR using cooling liquid as carrier medium
- All cells and high current carrying parts are totally immersed in 3M Novec liquid
- Designed for mechanical load carrying
- Ultralight design and most dense packaging of cells and modules in a given space
- All cells are double fused



# The **LIGHT** Battery Business Modell

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## **LIGHT** **Battery Franchise**

### **Advantages Supplier**

- Reduces supply chain complexity
- Increases volume
- Broadens entry into a new market
- Accelerates market dominance
- Transparent market
- Reduces R&D cost
- Dedicated contact for production issues
- Less market risks through proven idea
- Ongoing assistance
- Increases brand recognition as more and more locations open

### **Advantages Franchisee**

- Reduces complexity
- Shortens time to market
- Audited Supplier Network
- Reliable quality
- Reduces costs via shared resources
- Full automation, best price
- State of the art technology
- Less to no R&D costs, highly competitive
- Reduces risks by means of safety mechanisms, proven idea
- Use of a recognized brand name



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**Industry sector** E-Mobility

**Segments** Battery Testing, Battery Design  
and Prototyping, Battery  
Management Systems,  
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