Vision & Mission

VISION  We electrify the future!

MISSION  Successfully overcome challenges of energy storage applications
Market & Business Environment

- Forecast global sales of electric vehicles: 301 billion EUR in 2020 and 459 billion EUR in 2030 (McKinsey)
- At least one battery management system per battery pack required for each application
- Positive trend continues to accelerate in 2017 and 2018
- Massive multi billion funding for EV related development and research by the EU
- Germany intends to inject 1.2 billion Euro to promote EVs
- Car manufacturers want to invest multi 100 billion in research & development
- Trillion Dollar market
Corporate Structure & Business Segments

**Investments**
- LION E-Mobility North America Inc.
- ParkHere <10%
- Inboard <5%
- Eliso 8%

**Divisions**
- Batterymanagement-system & Components
- Engineering & Prototyping
- Consulting & Studies
- LIGHT Battery

**Joint Ventures**
- 70% JV
- 30% JV

**Partners**
- TÜV SÜD AG
- TÜV SÜD Battery Testing GmbH

**Other**
- LION Smart GmbH
- TÜV SÜD AG
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
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 galvanic isolations and connectors
- Easier to assemble and test due to wireless technology
- Better state of charge modelling due to time stamp data

**Future benefits**
- Lower costs compared to present system
- Module test results while on the line (Industry 4.0) vs. full assembly and test

Wireless technology promises to significantly improve reliability and simplify the design of automotive battery management systems
Markets and Technologies
Accelerate the Discovery of Emerging Technologies

Exploring future applications

► Energy harvesting and storage
► Advanced sensors
► Security
► User interfaces
► Wearable, portable, and implantable
► Innovation beyond silicon
  ▪ Machine learning
  ▪ Algorithms and analytics
  ▪ Cloud connectivity
  ▪ Optics, magnetics, and biochemistry
  ▪ III-V compounds

Employee Intrapreneurships
► New business incubator and idea accelerator

Directed Research in Collaboration with Universities

Venture Program
► Partnering with external accelerators and VCs to enable promising start-ups
Automotive

Innovation Driven by Increased Electronics Content

Changing industry creates opportunities to re-engineer mobility

► Regulations demand continuous improvements in safety
  • Radar, lidar, inertial, vision, sensor fusion

► Industry legislation mandates lower emissions and increased fuel efficiency
  • Start-stop, electrification, sensors

► New business models require smarter, more connected vehicles
  • Improved audio, voice, HMI, telematics

► Allure of autonomous vehicles enables new mobility models
  • Increasing sensors, communications, security

High fidelity audio with significant cable-weight reduction

Predict and Prevent
► 24 GHz, 77 GHz radar
► Lidar
► High accuracy gyro

More Power and Efficiency
► Battery monitors
► xMR sensors

Intelligent Vehicle
► Audio and video processing
► Telematics
► Driver monitoring
System focus driven by technology leadership and customer insights

- Innovative radio architectures and algorithms
- Discrete and integrated wireless solutions to optimize our customers’ radio architecture
- World-class control, clocking, and power technology for advanced networking applications

Wireless
- Full frequency spectrum (dc to 110 GHz)
- 2G to 5G, PtP, satcom
- SDR

Wired
- Continued investment in underlying technologies to support wired network growth

Technology and design ecosystem for wireless systems
Insights that Deliver Intelligent IoT Solutions

Cultivate a complete and impactful customer solution with

- Precise measurement
  - Better data equals more insight
- At the node processing
  - Intuitive and efficient
- Superior technology across the IoT signal chain

- Solving challenges that couldn’t be solved before through advanced sensing and precision measurement
- Secured, scalable wireless mesh network connectivity solution
- Improving outcomes with analytics at the edge and the most reliable connection to the cloud

Reliable System-Level Solutions Through Ecosystem Partnerships

LifeQ | scio

Smart City | Smart Building | Smart Infrastructure | Smart Industrial Plant

Smart Health | Smart Agriculture | Smart Machine | Smart Energy

SYPRIS SOLUTIONS | dust networks®
Enabling a High Frequency World

1000+ Ways to Drive RF and Microwave Performance

- Industry’s broadest portfolio with over 1000 RF IC’s, single chip and module packages
- Highly integrated solutions for communications, instrumentation, military, and industrial markets.
- Unique combination of design skills, deep systems know how, and a diverse range of process technologies

Supporting the Complete Signal Chain

- A complete selection of parts for each component in the RF signal chain
- Wideband high performance parts from dc to 100 GHz
  - Smaller footprint
  - Easier integration
  - Higher performance

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Achieve New Levels of Power

Value Pillars for Power
- High performance
- Consistent quality
- Reliability
- On-going no obsolescence policy
- Customer and factory support

Uniquely Capable of Simultaneously Delivering 3 Power Performance Metrics
- High power efficiency
- Small form factor
- Low EMI

Broad Array of Market Solutions
- Automotive
- Communications
- Industrial solutions
- Consumer electronics

#1
High Performance Power Leader Targeting High Growth B2B Markets

Demands for High Performance Power Accelerating

Uniquely Positioned to Drive Customer Value Creation and Revenue Synergies
Where the ideas came from

Wireless BMS Project (2016 / 2017)
- Based on BMW i3 vehicle
- BMS Master – Slave Communication via Linear Technology’s Dust SmartMesh
- Kreisel Electric Battery Standard Modules
- 55 kWh

Benefits
- No bus wiring in the battery
- Production testing and tracking over the air -> Industry 4.0 ready
- High energy density, high cooling capability

Improvement opportunities
- Still complex sense wiring harness necessary
- Safety, homogeneous cooling, adaptability, sealing
- …
Challenge for successful battery concepts

- Low cost, high quality solution
- Fully automated high speed production
- Absolutely safe: Failure tolerant design, single cell fusing, extinguishing concept
- Best energy density for highest capacity, best range
- Optimal thermal management -> Fast charging capability, best life span
- Best integrability due to modular and flexible architecture
The **LIGHT** Battery Concept

https://www.youtube.com/watch?v=XnRKiOMeFp0
The **LIGHT Battery**

Modular and flexible Architecture

- Cell and principal design of super cell, module and system is constant
- Size of super cell, module and system can be customized to match required:
  - voltage level
  - installation space
  - thermal requirements
  - energy and power
- The only part to be changed is the super cell housing and the module endplates
The **LIGHT** Battery

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
Symmetrical and self-similar liquid flow

- No valves needed
- Homogeneous cooling through all Super Cells
- Low flow resistance
The **LIGHT Battery**

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 - 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
Consulting & Studies

Network

- European OEMs
- Technical university of Munich (FTM, EES)
- German government (BBSR, BMVBS, BMBF)
- European Commission (Horizon 2020)
- Swiss Federal Institute of Technology in Zurich (ETHZ)

Studies

- Home storage systems market study
- Secondary use of lithium-ion batteries of propulsion systems
- Electric mobility in co-work with Valentum GmbH
- Trend & market research in the field of drive propulsion systems such as lithium-ion storage technology
Joint Venture: TÜV SÜD Battery Testing GmbH

- Successful and synergetic partnership with TÜV SÜD AG
- Turnover increased from 4.76 million EUR in 2016 to 6.66 million EUR in 2017
- Leading battery testing laboratory in Europe
- State-of-the-art testing facilities for automotive and stationary batteries
- TÜV SÜD brand as a multiplier

LION Smart is an exclusive partner of TÜV SÜD for battery testing in Europe
History of the Company

- Founding of LION Smart GmbH (2008)
- Founding Joint Venture TÜV SÜD Battery Testing GmbH (2009)
- Founding of LION E-Mobility AG (2010)
- Visio. Mt: research project (2011)
- Listed on Munich stock exchange (2012)
- Several high power battery packs for different EV projects (2013)
- 296% revenue growth (2014)
- New facilities (2015)
- Founding of LION E-Mobility North America Inc. (2016)
- Light Battery Concept (2017)
- Stationary storage - Effizienzhaus Plus
- „Mute“ battery pack
- Battery pack for Visio.M
- LION Smart Battery Management System
Management

Daniel Quinger, CEO LION E-Mobility, President of the Board of Directors

Mr. Quinger is the founder and head of battery-management-systems at LION Smart GmbH and former CTO at TÜV SÜD Battery Testing GmbH from 2011 to 2013. He has extensive experience in the automotive industry, testing of lithium-ion batteries, strategic innovation management and product development. Prior to founding LION Smart GmbH, he worked in different positions for 3M, BMW (Technology Office-USA), EVA Fahrzeugtechnik and ENAX Batteries in Europe, North America and Japan.

Roland Bopp, CEO Americas, Member of the Corporate Management

Mr. Bopp has extensive background at senior levels in the telecom, automotive and machinery industry. Prior to joining to LION E-Mobility, he was Chairman, President & CEO of Deutsche Telekom Inc. New York, a subsidiary of Deutsche Telekom AG, Germany and Executive Vice President, and member of the operating board of Mannesmann Corp. in New York, NY and Düsseldorf, Germany. During his professional career, he has successfully built established and early stage companies in North America, Europe and Asia.

Tobias Mayer, CTO LION E-Mobility, Member of the Corporate Management

Mr. Mayer is the founder and the chief technology officer of LION Smart GmbH. He has extensive experience in design, automotive engineering and product development. Prior to founding LION Smart, he worked for BMW in project and quality management. During his studies he was the head of the formula student racing team.

Hany Magour, CFO LION E-Mobility, Member of the Board of Directors

Mr. Magour is a versatile, entrepreneurial manager with 20+ years experience in business development & financial management. He has broad international experience in business analysis, strategic planning, marketing, product management, project management, IT and supply chain management in electronic products, fintech, software design, and various other fields.
Operating Business & Joint Venture Financials

### LION Smart GmbH

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<th>Year</th>
<th>Employees</th>
<th>Annual revenue (000€)</th>
<th>Net profit after taxes (000€)</th>
<th>Balance sheet total (000€)</th>
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### TÜV SÜD Battery Testing GmbH

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1. Market growth
   - Strong market increase of electrified vehicles and energy storages
   - Substitution of lead-acid starter battery
   - Need to store renewable energy

2. Positioning of LMI
   - Growth even in the early phase (development time)
   - Strong demand for battery testing services
   - Expansion abroad possible with the TÜV, e.g. Asia
   - Battery Management System – biggest potential in the future

3. Dividend policy
   - In current growth phase, profits are reinvested in the JV and in the subsidiary
   - In the saturation phase dividend distributions to shareholders are planned

4. Senior management commitment
   - Senior management is the largest shareholder group and thereby ensure credibility and stability
LION E-Mobility AG
Shareholder Structure

Facts

- **Head Office**: Switzerland
- **Head Office**: Switzerland
- **Industry Sector**: E-Mobility; Segments: Battery-Tests, -Prototyping, -Management-Systems
- **WKN**: A1JG3H
- **ISIN**: CH0132594711
- **Symbol**: LMI
- **Listings**: Xetra, Frankfurt, Munich
- **Internet**: www.lionemobility.com
- **52-Week-Range**: 5.89 – 9.40 EUR
- **Outstanding Shares**: 7.68 Mio.
- **Market Capitalization**: 55.9 Mio. EUR (16.01.2018)

Graph showing shareholder structure with percentages:
- Founder & Employees: 38%
- Strategic Seed Investors: 36%
- Institutional Investors: 15%
- Free Float: 11%
LION E-Mobility AG
Share Price 02.01.2017 – 07.06.2018

02.01.2017: €6.48
07.06.2018: €5.46

source: finanzen.net, listing: XETRA
Contact

**Company**  
LION E-Mobility AG  
Lindenstraße 16  
6340 Baar  
Switzerland  
www.lionemobility.com

**Contact**  
North America:  
LION E-Mobility North America Inc.  
Roland Bopp  
Phone: +1 917 345 6365  
roland.bopp@lionemobility.com

Switzerland:  
Walter Wimmer  
Phone: +43 (0) 664 4331367  
ir@lionemobility.com
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