# Leclanché

### **Corporate Presentation**





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### **Leclanché Globally**

#### **Key Figures**



#### **Key Markets Addressed**

Advanced batteries for heavy-duty commercial applications





**STATIONARY** 

SOLUTIONS

#### Sustainability

- 100% renewable electricity used for all production
- Unique water-based electrode manufacturing process (no solvents)
- 90% of our cell materials are recyclable and recoverable
- Systematic reduction of CO<sub>2</sub> emissions of supply chain and operations

#### **Process & Quality Certifications**





### **Our Milestones**





### Leclanché Global Presence





\*Energy Management Software

### **Senior Leadership Team and Board Members**

#### **Executive Officers**



Phil Broad CEO E-Mobility SA & Group CCO



**Pierre Blanc** Group CEO & CTIO



Hubert Angleys Group CFO

#### **Board Members**



Lex Bentner Chairman



**Christophe Manset** 



Marc Lepièce



Shanu Sherwani



### Leclanché Technology

We control the value chain of our battery systems from powder to pack



Our value chain provides the following advantages:

 Clear technology roadmap
 Control of the full process
 Solutions that match customer specifications
 Intimate knowledge of core technology



# **Product Lines**

**Energy Storage Solutions** 

- Catalogue and customer specific products engineered and certified to industry standards.
- E-Mobility products are based on our in-house manufactured cells, modules and battery systems.
- Dedicated Multi-String Managers designed to combine multiple battery systems.



Advanced generic battery systems for rail and marine applications featuring Leclanché European made G/NMC cells.

#### Rail

#### **INT-53 Energy**

- Leclanché high energy density G/NMC cells
- Class leading cycle life
- Liquid cooled
- Modular and scalable
- IEC 62928 certification



#### Marine

#### Navius MRS-3

- Leclanché high energy density G/NMC cells
- Class leading cycle life
- Functionally Safe BMS
- Liquid cooled
- Multiple configurations & 7 height options
- Superior safety with Battery Active Safety System



Technical Data	
Energy	52.6 kWh
Cycle life (60Ah cell, at 80% DoD) $^1$	8,000 <sup>1</sup>
Weight	505 kg
Voltage (nominal)	876 V
Dimensions (L x W x H)	1631 x 612 x 409 mm

Technical Data	
Energy	80 kWh to 50 MWh+
Cycle life (65 Ah cell at 80% DoD) <sup>1</sup>	7,000
Energy density (65 Ah cell)	101 Wh/kg / 108 Wh/litre
Voltage (maximum, DC)	1200 V
Dimensions (D x W x H)	700 x 435 x 926 to 2,431 mm



Design optimised products for Marine and Stationary applications.

#### Road

#### Fortius-145

- Leclanché high energy density G/NMCA cells
- Class leading cycle life
- Liquid cooled
- Modular and scalable
- IoT remote monitoring\*
- Available from 2025



Technical Data	
Energy	147 kWh
Cycle life (80% DoD)	6,000
Weight	975 kg
Voltage (nominal)	670 V
Dimensions (L x W x H)	1,781 x 564 x 738 mm

#### Road

#### **INT-39 Energy**

- Leclanché high energy density G/NMC cells
- Class leading cycle life
- Liquid cooled
- Modular and scalable
- IoT remote monitoring\*
- ECE R100.2 certification



Technical Data	
Energy	39.4 kWh
Cycle life (80% DoD)	8,000
Weight	372 kg
Voltage (nominal)	657 V
Dimensions (L x W x H)	1266 x 612 x 409 mm



\*Option available when a Multi-String Manager (MSM) is also specified.

Design optimised products for Stationary applications.

#### Stationary

#### LeBlock

- Modular and scalable concept
- Integrated auxiliaries
- Plug & Play: easy to interconnect
- Simplified logistics
- Fast installation on site
- Liquid cooled
- Certification: ANSI/CAN/UL 9450A

Technical Data	
Energy	744 kWh to 50 MWh+
Current (maximum, DC)	3,600 A
Weight (Combi Block / Battery Block)	1,100 kg / 7,500 kg
Voltage (maximum, DC)	1,500 V
Dimensions (D x W x H) in mm Dimensions (D x W x H) in inches	2,664 x 1,457 x 2,896 8.74 x 4.78 x 9.50





Multi-String Manager (MSM) for road battery systems where more than one battery pack/string is used in parallel.

#### Multi String Managers

#### MSM-M3-GRT

- Designed to interface seamlessly with existing Leclanché road and rail battery packs.
- Reliable controller for the connection multiple packs or strings in parallel.
- IoT edge device for remote monitoring\*

Technical Data	
Application	Road (Packs with M3 Modules)
Quantity of packs	4
Weight	4.5 kg
Hardware	Bosch
Remote data-logging (option)	Wi-Fi / GSM
Dimensions (L x W x H) in mm	380 x 255 x 111



#### MSM-M3-RA

- Designed to interface seamlessly with existing Leclanché rail battery packs.
- Certifications (controller): Rail
  - EN/IEC 61373, EN 50657, DIN EN 50125-1,
  - EN 50155 / IEC 60571



Technical Data	
Application	Rail (INT-53 Energy pack)
Quantity of packs	8
Weight	0.259 kg (controller only)
Hardware	Wago
Software	Leclanché SA
Dimensions (L x W x H) in mm	100 x 112 x 72 (controller only)



\*Optional. The IoT edge device is integrated within the MSM enclosure.

#### Commercial Vehicle & Rail



Alstom AGC Train INT-53 Energy







e-RAIL



Refuse Truck INT-39 Energy



INT-39 Energy

ALSTOM CPKC KONČAR



UROMAC

Major Truck OEM Refuse Truck Fortius-145

FCC



Defence OEM Defence vehicle INT-22 Energy

URO



Note: Non-exhaustive list



#### Marine







Damen #1 (L. Ontario) Ro-Pax vessel System energy: 1.9 MWh



System energy: 4.6 MWh























Note: Non-exhaustive list



\*Project won, system to be delivered

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#### Marine





**CMAL Islay (4x)\*** Ro-Pax 1.1 MWh x 4 Delivery: 2024 / 2025



Cadeler\* Windfarm Vessel 5.2 MWh Delivery: 2025







Lafarge Marsouin\* Ro-Pax vessel System energy: 0.8 MWh Delivery: 2025



Confidential Yacht (4x)\* Super Yacht 5.5 MWh (total) Delivery: 2024 / 2025

**CADELER** 

-fugro



Viking Energy Offshore Supply Vessel System energy: 0.8 MWh Delivery: 2025



AKA / Fugro Voyager Seismic exploration vessel 1.0 MWh Delivery: 2025





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\*Project won, systems to be delivered

WÄRTSILÄ

#### Stationary



**Enel Green Power** Cremzow, Germany Frequency regulation System energy: 34 MWh



Veolia Gas Power Plant Levice, Slovakia Secondary Frequence Control System energy: 5.2 MW / 2.9 MWh



S4 Energy Noord Holland, Netherlands Frequency regulation System energy: 9 MWh



Damen Shipyards\* Millhaven/Kingston, Canada Load displacement & vessel charging System energy: 6 + 10 MWh



**Romande Energie** Aigle, Switzerland Frequency regulation & EV charging System energy: 2.5 MWh



**Terna Energy** Crete, Greece Solar + storage System energy: 5 MWh







SGEM Marengo, USA Frequency regulation System energy: 20 MWh



**Olmatic GmbH\*** Sembach, Germany Frequency regulation System energy: 12 MWh





Green Power







ROMANDE ENERGIE

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\*Project won, systems to be delivered

# **Cell Technology and Roadmap**

Leclanché is continuously enhancing the energy output / capacity of its cells

Cell energy is continually increasing while maintaining exceptional cycle life



Reduced cobalt in the cathode and higher energy materials to further reduce the costs per kWh

Materials with lower carbon footprint and energy-saving processing steps to make our batteries more sustainable



Over 160 patents covering cell technology included in 10 patent families



Continuous work on next generation cell technologies with partners from academia and industry



Control of the full value chain and supply of technologies designed for the specific application







# **Taking the Lead on Sustainable Batteries**

Reducing the environmental impact of our batteries at every stage of the life cycle

### Leclanché 6R Circular Economy Concept

### **Recycling & Reuse**

- Up to 95% recyclable
- Collaboration with leading recycling partners



### **Consumption & Use**

- Class leading cell cycle life to maximise battery service life
- Global after-sales services with IoT for maintenance optimisation



### Manufacturing

- 100% renewable electricity used at all production facilities
- Solvent free thanks to water-based cell production process

### **Battery Carbon Footprint**

Measurement of our environmental impact and avoided emissions

- The new EU battery regulation of July 2023 set up a mandatory carbon footprint declaration for batteries
- Performance classes and maximum limit set to challenge the industry
- Low carbon footprint will become a key buying criteria

Leclanché's battery carbon footprint is already 35% lower compared to average battery producers thanks to:

- Production running on 100% renewable electricity
- Unique water-based binder process





# **Production Technology**

- Leclanché designs and manufactures cells and modules in-house
- Development of formulations, production processes and characteristics of the electrodes
- Manufacture of graphite anodes, NMC622 and NMCA cathodes

#### Cells

- High-energy density and high-power cells
- Class-leading cycle life
- New "Flame Retardant" (FR) cells
- Manufactured in a state-of-the-art automated production facility in Germany
- Electrodes made exclusively using a waterbased binder (WBB)
- Experienced in production of LTO anodes

Technical Data	60Ah FR	60 Ah	65 Ah	72 Ah
Cell chemistry	G/NMC	G/NMC	G/NMC	G/NMCA
Cell type	Pouch	Pouch	Pouch	Pouch
Cycle life (80% DoD) <sup>1</sup>	8,000	8,000	7,000	6,000



#### Modules

- Specifically designed for transport applications
- Available in 8 configurations
- Functionally Safe slave unit
- 400A (medium) or 800A (high) power variants
- Assembled on an automated production and testing facility, designed to automotive industry standards



Technical Data (with 65Ah cell)	20 cell	24 cell	32 cell	36 cell
Energy	4.8 kWh	5.8 kWh	7.7 kWh	8.7 kWh
Configurations	2	1	2	3
Weight	32 kg	38 kg	50 kg	55 kg



# **Production Facilities**

Leclanché is one of the few battery system suppliers that manufactures cells in-house, in Europe

#### **Cell Production Line** Willstätt, Germany



- In-house cell production from raw materials
- Patented unique water-based manufacturing process for all electrodes, in production since 2012
- Producing pouch cells with G/NMC and G/NMCA chemistries



European cell and module production

### Scalable production technology



XXX



- Certifications that de-risk planned expansion
  - Production facilities with 100% renewable energy
    - Products designed by Leclanché engineers & electrochemists

#### Module Assembly Line Yverdon, Switzerland



- State-of-the art automated production facility, designed with leading engineering company Comau (Stellantis Group)
- 400 MWh per year, and further expandable
- More than six times the production capacity of the previous module line



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