POLICY TECHNOLOGY MARKET
ENERGY STORAGE Global Conference
24 - 26 October 2018

LMP® - the 100% solid state battery

Session1.9a: Introduction to Small-Scale Energy Storage Technologies

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Bolloré

Established in **1822**

85,000 employees in **143** countries

Turnover in 2017: **€17 bi**

BOLLORÉ TRANSPORT & LOGISTICS

TRANSPORTATION AND LOGISTICS

One of the leading groups in freight forwarding and logistics, **leader in Africa** with 36,000 employees

vivendi

COMMUNICATION AND ENTERTAINMENT

World leader in Entertainment and Advertising

HAVAS CANAL+ GAMELOFT UNIVERSAL

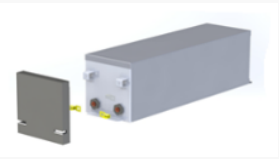
BlueSolutions

ELECTRICITY STORAGE AND SOLUTIONS

Electromobility & Energy storage solutions

LMP®: A UNIQUE AND INNOVATIVE BATTERY TECHNOLOGY

LMP® Module



LMP® Pack

LMP® Block

A **100% solid battery**	Calendar life: **15 years**
No thermal runaway reaction **No risk of fire**, explosion, leakage	**Warranty**: neither provision clause on temperature nor average SoC*
Highly stable in aggressive temperature environment	**No cooling system** required to manage batteries temperature
Full capacity available, from **0 to 100%**	**Capacity** remains **constant** during lifetime: neither degradation mitigation strategy nor initial oversizing needed
No cobalt **No solvent** **No rare minerals**	Easy management of spare batteries: one yearly charge only

** SoC: State of Charge*

LMP®: THE 100% SOLID STATE BATTERY

Anode : Lithium foil

Electrolyte : PEO + Lithium salts

$LiFePO_4$

$\leftrightarrow$

$Li_{1-x}FePO_4 + xLi^+ + x\,e^-$

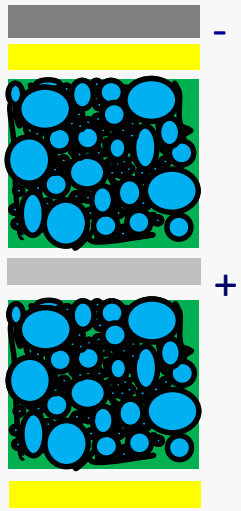
Current collector : Aluminum foil

$LiFePO_4$

$\leftrightarrow$

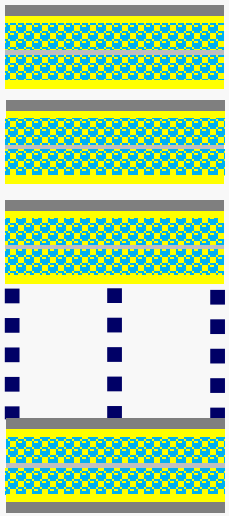
$Li_{1-x}FePO_4 + xLi^+ + x\,e^-$

Electrolyte : PEO + Lithium salts



The different materials are stacked together

⇒ 1 Foil



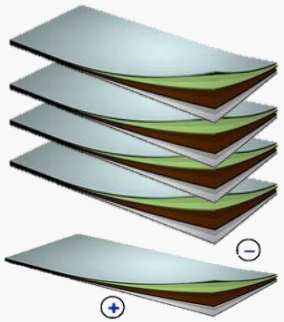
The 4 foils are assembled and stacked to the desired thickness

⇒ 1 Cell

Cells

⇒ 3,4 V

⇒ 230 kWh/kg



Modules

⇒ 20 cells

⇒ 70 V

⇒ 7 kWh

DENSE, SAFE & ROBUST SOLUTION ADAPTED FOR EXTREME CLIMATES

	Lithium Ion		LMP
Battery type	LFP	NMC	
Chemistry formula	LiFePO4	LiNiMnCoCO2	Lithium Metal Polymer
State of batterie	Liquid	Liquid	Solid
Specific Energy	130 - 150 Wh/kg	160 - 210 Wh/kg	230 Wh/kg
Energy Density	240 - 290 Wh/L	280 - 310 Wh/L	360 Wh/L
Type of Charging	Slow and Fast charging	Slow and Fast charging	Slow charging
Nominal cell voltage	3,2 V	3,6 V	3,4 V
Storage Temperature	-30°C+ 60°C	-30°C+ 55°C	-40°C+ 85°C
Operating Temperature	0°C+ 45°C	0°C+ 40°C	-30°C+ 65°C
Cooling system	Air or Liquid	Air or Liquid	No

Advantages of the LMP®:

- No cooling system required, better efficiency and more reliability
- Low sensitivity to temperature variations, no impact on cycle life
- Higher density compared to other battery technologies

TARGET MARKETS: APPLICATIONS

OFF-GRID

Individuals & States

RURAL ELECTRIFICATION

Energy access to remote off-grid villages based on hybrid power unit with storage solutions, offering a sustainable solution promoting local economic development

Commercial & Industrial

HYBRID POWER UNIT

Hybrid power system combining renewables production, GenSet and storage capacity to offer independence from rising diesel prices and reduce operating and maintenance costs

ON-GRID

Utility Services

RENEWABLE INTEGRATION & SERVICE SYSTEM

Large scale storage capacities to provide services such as intermittency smoothing, load shifting, frequency regulation or transmission deferral services

MOBILITY

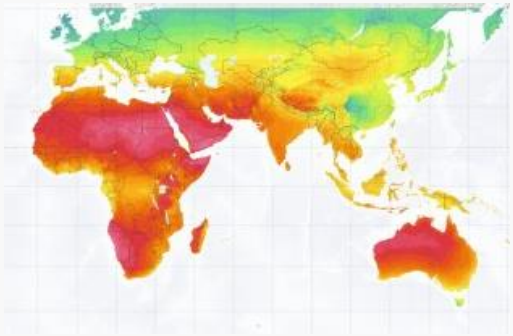
Manufacturers & smart cities

BUS, MACHINES & CARSHARING, CHARGING INFRASTRUCTURES

Battery packs to equip mobility equipment and provide clean, renewable and sustainable smart e-mobility solutions including charging infrastructures

TARGET MARKETS: SPECIFICS

Solid



Extreme temperatures

No air-conditioning required allows enhanced performances

No effect on the battery's lifespan

Robust & reliable

Isolated areas

No air-conditioning required allows simplified maintenance, transport & storage

Safe

Indoor & mobility

No risk of leakage

No risk of explosion or fire

Sustainable

Eco-friendly regulations

No solvents nor rare earth metals

Cobalt-free

Highly recyclable

REFERENCES

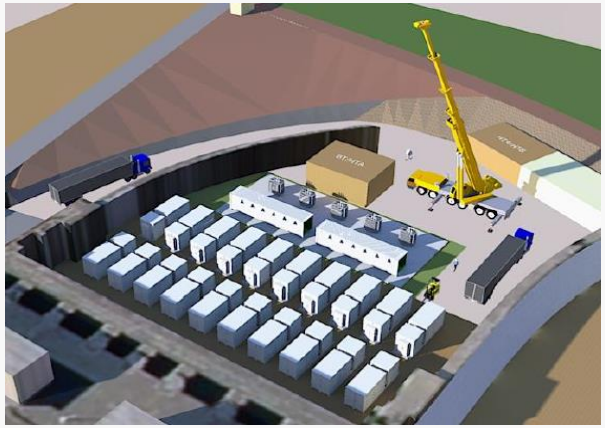
#1 E-carsharing company

250 million kilometers

25 micro-grids

Energy storage solutions for difficult conditions

OUR IMPACT NOW



VENTAVON : ~40 MWh – 2020
On-going project
Service System for RTE (Réseau de Transport d'Electricité)

Ringo project: Large scale storage system connected at a specific point of the high voltage grid to avoid grid congestion due to the intermittency of close renewable energy production installations

CANAL OLYMPIA : 20 MWh – *5 MWh already installed throughout Africa*

Vivendi Group is developing the first network of cinema and live performance venues in Africa by building **50 entertainment centers powered by 100% green energy**

RAPT – PARIS

More than 240 Bluebus are circulating throughout the world.

SINGAPORE – E-CAR SHARING

Reducing cars in the cities and improving green mobiilty

BlueSolutions by Bolloré

EASE
European Association for Storage of Energy

Meet us at Booth 7
Visit us also online at www.blue-storage.com