



MAT4BAT Summer School

Next Generation Batteries

La Rochelle, the 4th of June 2015



Agenda

1. Battery market evolution
2. Technical evolution



1. Battery market evolution

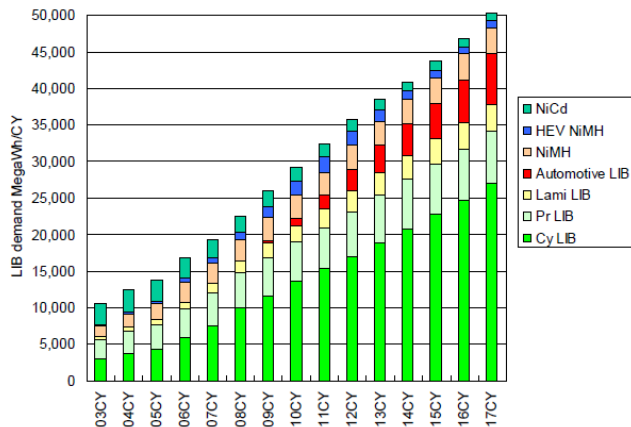
Battery market evolution

Feedback on market projection:

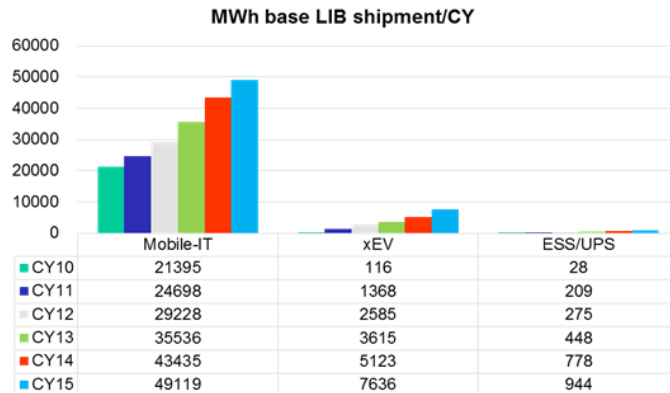
B3 Corporation

President Hideo Takeshita

25th Int. Bat Seminar 2008: 40 GWh expected in 2014



Battery Japan 2015: 50 GWh in 2014



If we look backward, Battery market is beyond expectation

Battery market evolution

- First Industrial lithium-ion market: Space & defense market
 - Satellite Eutelsat W3A launched in March 2004 with Saft batteries
 - Dec. 2013: Inmarsat 5 F-1 satellite is the one-hundredth to use a Saft battery



Saft battery for space application

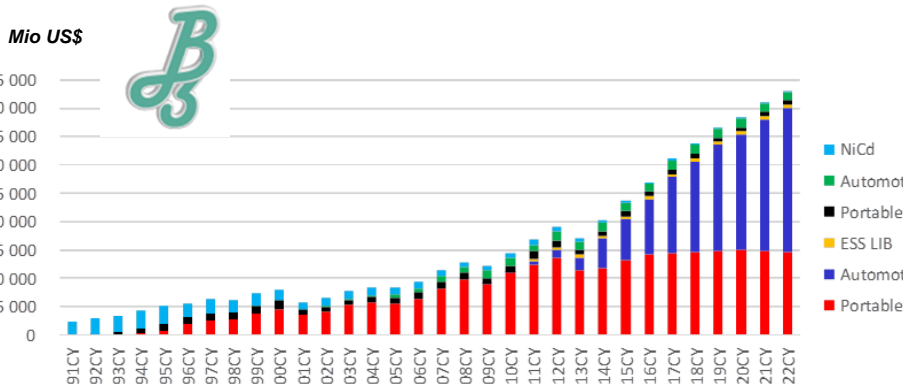


Eutelsat W3A

Battery market evolution

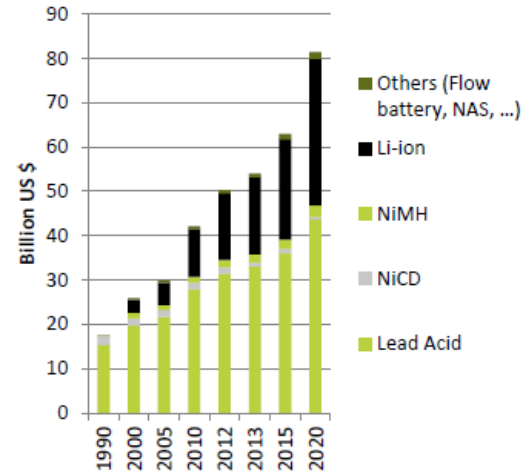
■ Automotive market

- Battery Electric Vehicles as a new source of growth for the short term ($\approx 10\%/Year$)
- « Portable » market quite flat
- Remember: Largest battery market share is Lead acid mainly driven by automotive SLI application



Long-term Demand Forecast for Secondary Cells (global market, in millions of USD)

President Hideo Takeshita
Battery Japan 2014



Christophe Pillot
Batteries 2014, Nice

Battery market evolution

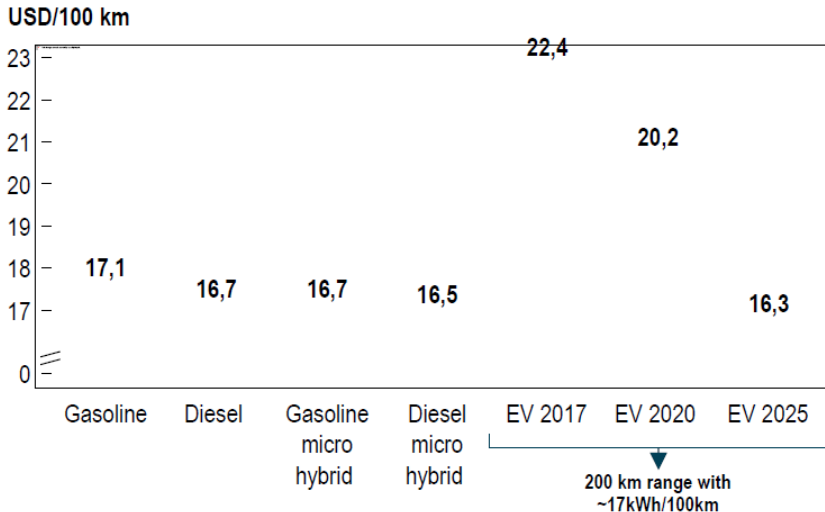
■ Automotive market

EVs will become TCO-competitive in Europe as battery costs decline

Roland Berger
Strategy Consultants

Aachen, April 2015

 TCO comparison 2025 EU1) – Example C-segment car



Battery market evolution

■ ESS and telecom markets

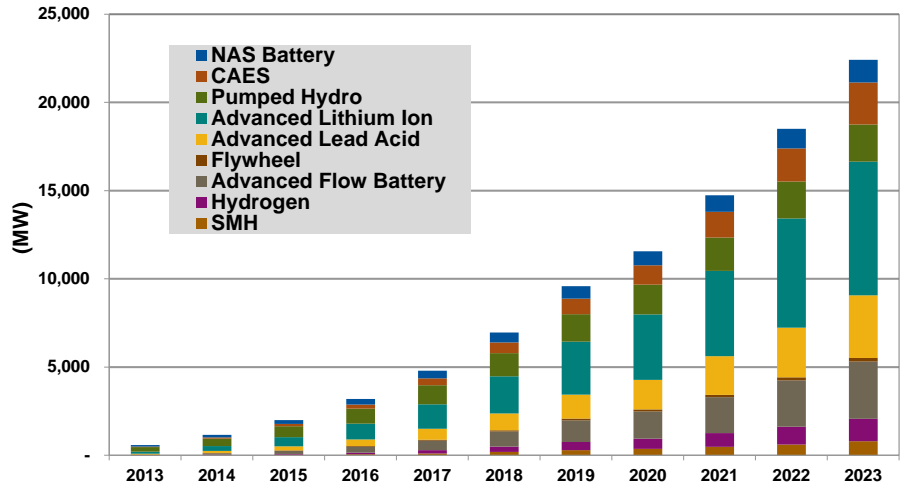
- ESS is seen as a new source of growth for the medium term
- Grid market addressed by a wide panel of energy storage technologies
 - > Secondary batteries and, in particular, Lithium-ion batteries have the most important market share



Energy Storage Technology Forecast, World Markets: 2013-2023

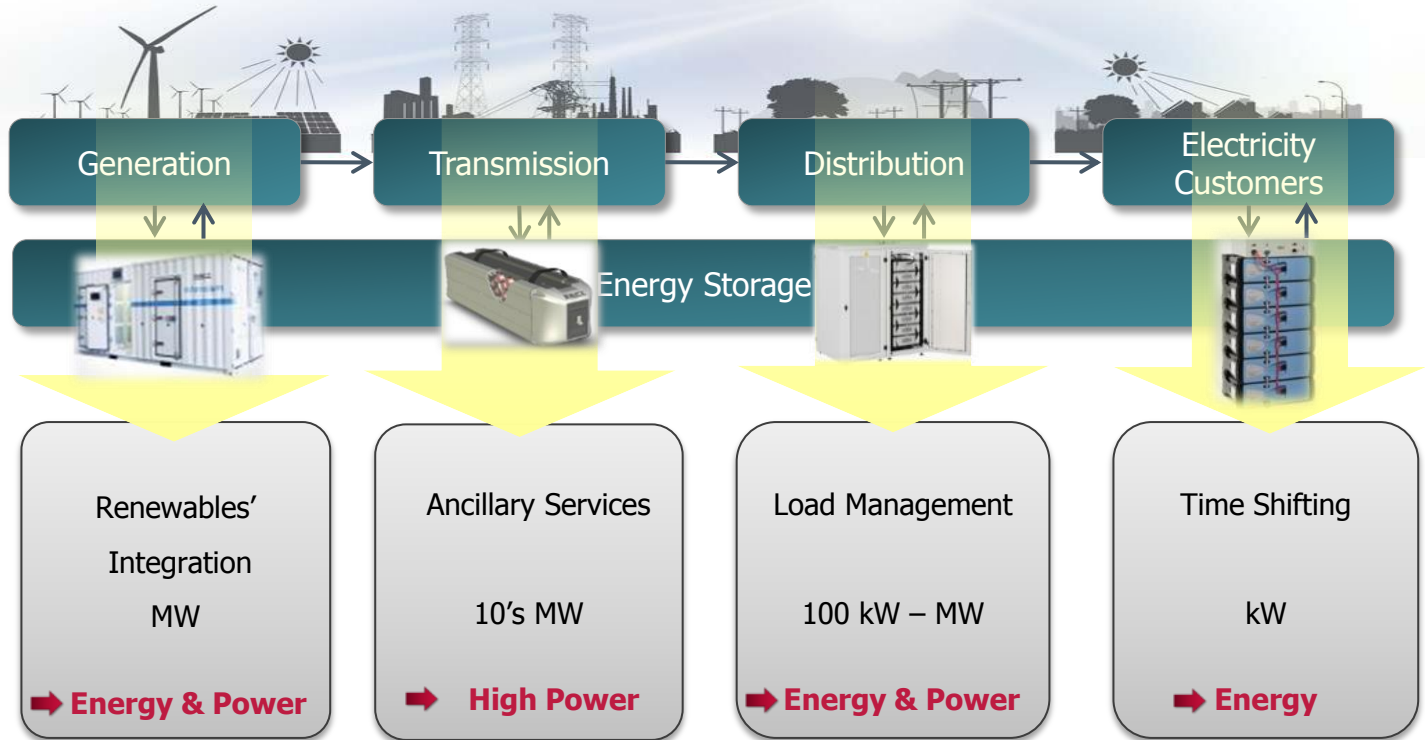
Anissa Dehamna
Battery Japan 2014

At 250 \$/kW => 10 000 MW
correspond to 2,5 Billion US\$



Battery market evolution

■ ESS and telecom markets: Saft products for ESS



Battery market evolution

■ ESS and telecom markets

- Telecom is a large market to support cellular telephony infrastructure
- Saft supplies Reliance Jio with Evolion systems for more than 50 million euros. The batteries are rolled out in more than 16 000 4G/LTE Base Transceiver Station (BTS) sites across India.



*Saft Evolion battery for
telecom market*

■ Other markets: Marine, Railways,



2. Technical evolution

Technical evolution

- **PRODUCTION: worldwide, large production capacities**
 - 2011: Saft announced that Jacksonville (US_FL) factory starts its production with a potential turnover of 300M\$/year



Land surface: 4.8 hectare (11.8 acres)

- 2013: Saft announced a production capacity of more than 100MWh/year at Nersac factory (Angoulême - FR)



Technical evolution

- SYSTEMS: Saft end to end capability from cells to systems



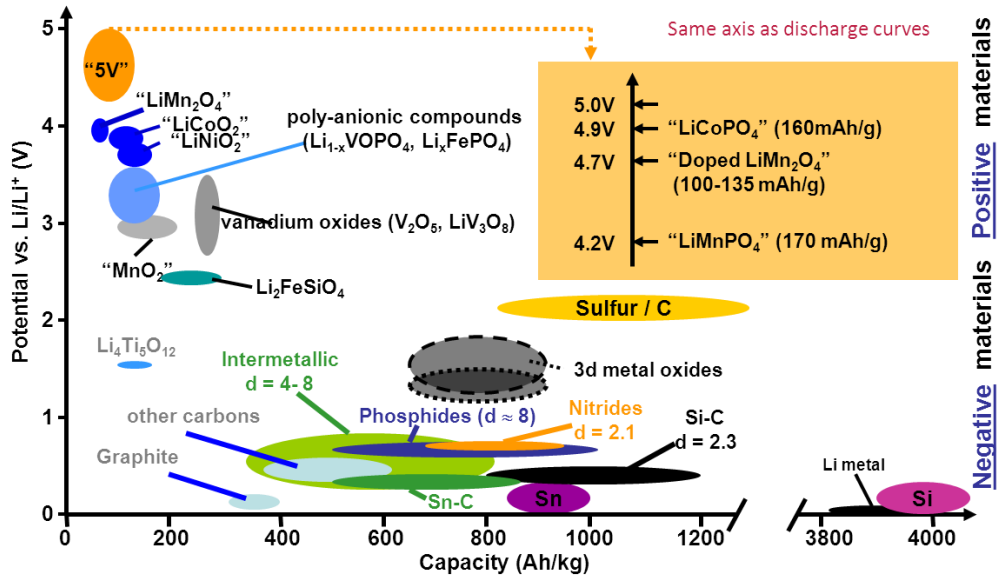
VL cells:
Energy to power

Synerion®
range of modules 24
or 48V and 2 to 12kW

Battery systems:
Intensium® Home
Intensium® Smart
Intensium®Max

Technical evolution

- CHEMISTRY: A wild range of lithium or Sodium chemistries exists
 - It provides different long term road maps for lithium-ion chemistry
 - Most of the time with Lithium Sulfur as the most promising long term candidate

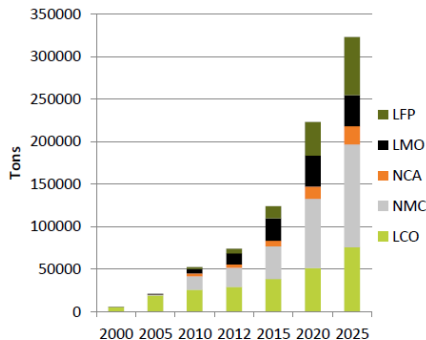


Source SAFT 2013

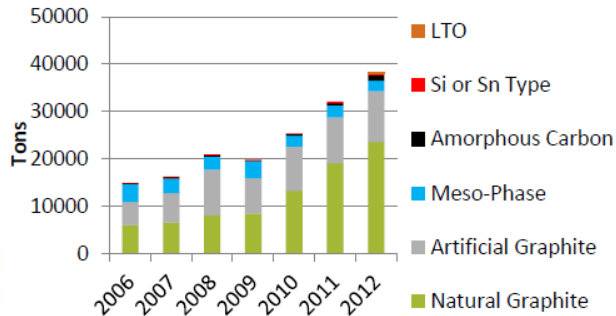
Technical evolution

- CHEMISTRY: Today lithium ion batteries include a large range of active materials for positive and negative electrodes
 - Lithium-ion technologies are known for the coming years

Cathode active materials 2000-2025 - Tons



LIB Anode market, (Tons)

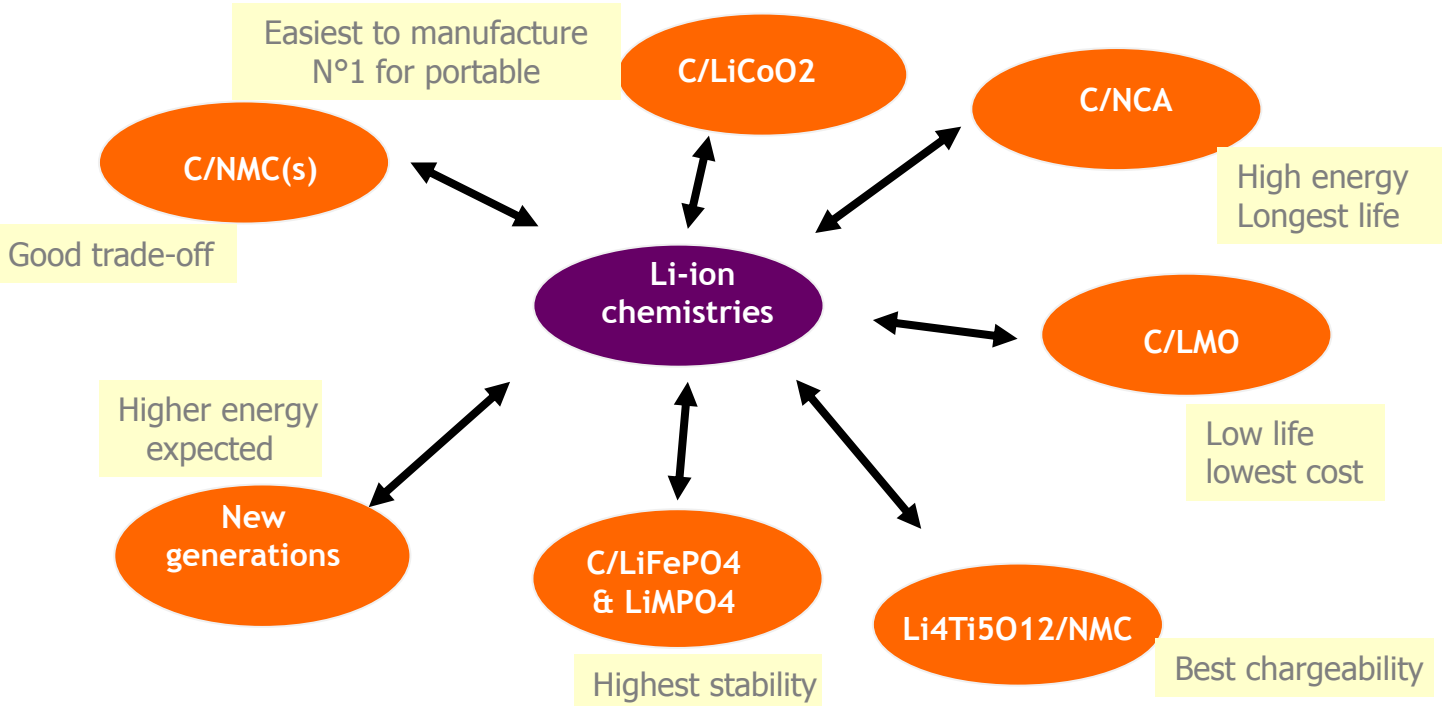


The Rechargeable Battery Market and Main Trends 2012-2025

Christophe PILLOT
Director, AVICENNE ENERGY

Technical evolution

■ CHEMISTRY (the blends are not mentioned)



Technical evolution

- Cost reduction has started (driven by demand increase, BEV market)
- Incremental increase of performances is expected
 - Innovation within the today materials families, electrolyte, cell design, battery system
- Long Term Next generation batteries can come from performance improvement, cost reduction, sustainable development: The field is open

■ The End