EU battery demand and supply (2019-2030) in a global context
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OBJECTIVES AND SCOPE

EUROBAT commissioned Avicenne Energy with this study in order to:

• Obtain a good picture of battery demand and production in Europe today and in the future
• To understand to what extent the EU battery industry will be able to cope with future demand

Applications covered

Automotive
- 12V batteries: SLI and auxiliary
- xEV batteries: mild hybrid, full Hybrid, plug-in HEVs and full EVs

Industrial
- Stationary: UPS, telecom, and Energy Storage Systems
- Motive (forklifts and others)

Technologies covered
- Lead-based
- Li-ion
- Others: Nickel-based (NiCd, NiMH), Zinc Air, Na-ion
The global battery market

• Automotive, industrial, stationary and motive power batteries
BATTERY MARKET DEMAND 2010-2030

Lead-based and Li-ion batteries will remain the most important markets

Market value will reach $150b in 2030

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EUROPE IN THE CONTEXT OF WORLDWIDE SUPPLY

Lead-based batteries: Europe accounts for ~20% of worldwide supply in MWh

Li-ion production in Europe will increase rapidly

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EU battery supply and demand: 2015-2030

- Battery supply vs. demand by application and technology
KEY TAKE AWAYS (1): CHEMISTRIES

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Lead-based battery demand (M €) in Europe (2015-2030)

Lead-based battery demand (MWh) in Europe (2015-2030)
KEY TAKE AWAYS (1): CHEMISTRIES

Lithium-based battery demand (M €) in Europe (2015-2030)

Optimistic Scenario

Conservative Scenario

Lithium-based battery demand (MWh) in Europe (2015-2030)

Optimistic Scenario

Conservative Scenario

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M €

MWh
### KEY TAKEAWAYS(2): APPLICATIONS - AUTOMOTIVE BATTERIES

<table>
<thead>
<tr>
<th>Conventional ICE and micro-hybrids (SLI and auxiliary batteries)</th>
<th>12V Batteries 2030 in GWh</th>
<th>Traction Batteries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mild Hybrid Vehicles</strong>&lt;br&gt;Strong growth expected: +48%</td>
<td><img src="image" alt="Lead 97% Li 3%" /></td>
<td>Chemistry is and will remain exclusively Li-ion&lt;br&gt;<strong>Li 100%</strong></td>
</tr>
<tr>
<td><strong>Full Hybrid Vehicles</strong>&lt;br&gt;Strong growth expected: +17%</td>
<td><img src="image" alt="Lead 97% Li 3%" /></td>
<td>Current mix of NiMH and Li-ion will move to 100% Li-ion by 2025-30&lt;br&gt;<strong>Li 100%</strong></td>
</tr>
<tr>
<td><strong>PHEV</strong>&lt;br&gt;Market share to grow slowly as a result of high cost.</td>
<td><img src="image" alt="Lead 97% Li 3%" /></td>
<td>Chemistry is and will remain exclusively Li-ion&lt;br&gt;<strong>Li 100%</strong></td>
</tr>
<tr>
<td><strong>EV</strong>&lt;br&gt;Strong growth anticipated (19-27%), but big difference in expected market share by 2030: conservative vs optimistic scenario</td>
<td><img src="image" alt="Lead 97% Li 3%" /></td>
<td>Chemistry is and will remain exclusively Li-ion&lt;br&gt;<strong>Li 100%</strong></td>
</tr>
</tbody>
</table>

- **12V Batteries**<br>Lead-based batteries will remain dominant with 12V Li-ion having only a very small market share (3%) by 2030.

- **Traction Batteries**<br>Chemistry is and will remain exclusively Li-ion
KEY TAKEAWAYS (3): APPLICATIONS - INDUSTRIAL BATTERIES

UPS (Uninterruptable Power Supply) Batteries
- **Lead-based batteries** will remain dominant in 2030 (70%)
- 5% annual growth to be expected up to 2030

Telecom Batteries
- Almost exclusively **lead-based** today, but Li-ion market share of 11% expected by 2030
- Small annual growth (3%) expected up to 2030

ESS (Energy Storage Systems)
- Today, mostly **Li-ion** batteries
- 10% annual growth expected up to 2030

Motive Batteries
- **Lead-based** batteries (90% market share) still dominant today
- By 2030, **Li-ion** will have majority share
- 4% annual growth anticipated up to 2030

Source: AVICENNE Energy 2020
EUROPEAN BATTERY PRODUCTION CAPACITY / DEMAND: OVERVIEW OF ALL TECHNOLOGIES COMBINED PER APPLICATION VS TOTAL DEMAND 2015-2030

European production capacity will be sufficient to meet demand
KEY TAKEAWAYS – EUROPEAN BATTERY PRODUCTION

1. Total European Production (all chemistries)
   - The European battery industry produces all chemistries and will meet demand thanks to lead-based and Li-ion batteries, comprising more than 90% of the total European battery market by 2030
   - NiCd and NiHM chemistries to survive, but only serving niche markets.

2. Lead-based Batteries
   - Europe will retain its strong position in 2030 and remain very competitive, but ongoing investment is needed to maintain/improve production and for R&D
   - Current/projected capacity will just meet current/projected demand
   - Key applications: 12V automotive, UPS (including back-up), telecom

3. Li-ion batteries
   - Ten-fold future growth potential and Europe is ready to meet demand, although currently heavily reliant on imports
   - E-Mobility is THE driver for growth
   - Key applications: xEV with EV batteries driving the technology (65% today, increasing to 85% by 2030)
OVERALL CONCLUSIONS

• Both **Li-ion and lead-based** batteries will be the two **mainstream** technologies by 2030, serving the different applications:
  
  ✓ **Lead**: 12V automotive, UPS (including back-up), telecom
  ✓ **Li-ion**: xEV, with EV batteries driving the technology (65% today, increasing to 85% by 2030)
  ✓ Development of technology connected to specific applications: e.g. forklift, railways, ESS

• The EU **lead-based** battery industry **will maintain strong position** and will be able to meet projected growth but **ongoing investments in R&D and production** enhancement are required.

• The European **Li-ion** battery industry is **set to serve growing demand** as of 2023/2024.
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Q&A

THANK YOU