What are the prospects for large-scale battery cells production in the EU?

Tesla/Panasonic factory, Nevada, US.  
CATL factory, Ningde, China.  
Northvolt project, Sweden.

Carole Mathieu  
Ifri Centre for Energy
Asian competitors taking the lead in the race for scale

2015 market shares of li-ion battery cells manufacturers (in volumes)

- Panasonic (w. Tesla) 26%
- Samsung SDI 25%
- LG Chem 18%
- SONY 9%
- ATL 8%
- Lishen 5%
- Others 9%

Source: Ifri, based on Avicenne figures

Announced battery cells production capacities for EV and storage applications by 2021

<table>
<thead>
<tr>
<th>Country</th>
<th>Capacity (GWh)</th>
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<tbody>
<tr>
<td>China</td>
<td>120 GWh</td>
</tr>
<tr>
<td>EU</td>
<td>29.5 GWh</td>
</tr>
<tr>
<td>U.S.</td>
<td>36 GWh</td>
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<tr>
<td>Thailand</td>
<td>50 GWh</td>
</tr>
<tr>
<td>Australia</td>
<td>15 GWh</td>
</tr>
<tr>
<td>South Korea</td>
<td>8 GWh</td>
</tr>
</tbody>
</table>

Source: Ifri, based on Bloomberg Intelligence, Benchmark Mineral Intelligence and company figures

- China is engaged in a fierce battle with Japanese and Corean incumbents:
  - 2 to 3 years behind in terms of technology BUT already leading in terms of capacity
  - Taking advantage of a huge domestic EV demand, supported with aggressive government policies and largely inaccessible to foreign competitors
Is it still time for EU players to react?

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>▪ They can offer EU OEMs a tighter control of their battery cells supplies</td>
<td>▪ EU automakers already have contracts with Asian suppliers for 2022-2025</td>
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<tr>
<td>▪ Political and financial support from the EU &amp; MS (EIB locans, removal of state aid restrictions)</td>
<td>▪ OEMs will be reluctant to tie their hands with new entrants</td>
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<td>▪ Lower electricity costs than in Asia</td>
<td>▪ Compared to China, the EU domestic market is small &amp; the export potential is limited</td>
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<td>▪ The lower carbon footprint of their products could help building a differentiation strategy</td>
<td>▪ No robust EU strategy for securing access to raw materials</td>
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<td>▪ Lack of skilled workforce in industry engineering</td>
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<td>▪ Asian suppliers are ready to locate part of their activities in Europe</td>
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<td></td>
<td>▪ Potential competition bw Member States pursuing their own battery strategies</td>
</tr>
</tbody>
</table>
EU projects: current state of play

NORTHVOLT
- Announced in spring 2017, construction to start in S2 2018
- Demo line ready mid-2019 with 8GWh/yr capacity
- 32GWh/yr production target for 2023/2024
- Investors: InnоЭnergий, Stena, Vattenfall, Vinnova
- Grant from the Swedish Energy Agency: €15 million
- EIB loan: €52.2 million

TERRA-E
- Announced in spring 2017
- Start of operation in Q4 2019 with 6-8GWh/yr capacity
- 34GWh/yr production target by 2028
- Consortium of 17 industrial stakeholders and research institutes, with BMZ as the main shareholder
- Benefiting from a €5.2 million grant from the German Ministry of Education

LG Chem Wroclaw factory
- Announced in 2016
- Start of operation in Q4 2018
- 100,000 EV batteries (4GWh/yr) production target
- €310 million to be invested up to 2020

Samsung SDI Göd factory
- Announced in 2016
- Start of operation in Q2 2018
- 50,000 EV batteries (2GWh/yr) production target
- €300 million investment

SK Innovation Komárom factory
- Plans to break ground in February 2018
- Start of production in early 2020
- 7.5 GWh/yr production target
- €620 million to be invested

Battery alliance between Saft, Solvay, Siemens and Manz
Focusing on high density li-ion solid state batteries for 2025

Source: Carole Mathieu, "The EU Battery Alliance: Can Europe Avoid Technological Dependence?", Édițio Énergie, Ifri, February 2018.
(Preliminary) conclusions and open questions

• Over the medium-term, the fate of these EU projects will depend on:
  • The ability of project promoters to develop pilot lines quickly and deliver up-to-date products
  • The EV market reality: cost-competitiveness easier to achieve in case of global cells shortage
  • How automakers see the risk of Asian competitors working up the EV value chain
  • The steps taken to encourage environmental and safety differentiation

• Open questions:
  • Is the cell-to-battery cost ratio stable? Will cells remain the key part of the value chain?
  • How to ensure that the location of battery manufacturing plants (by Asian players) benefit the nascent EU battery ecosystem?
  • Would the EU offer be stronger if the Northvolt, Terra-E & « battery alliance » merged?
  • How far can we go in terms of valueing the carbon footprint of EV batteries?
  • How can the EU help its domestic industry gain access to the Chinese EV market?
  • How can the EU help secure the supplies of raw materials?
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