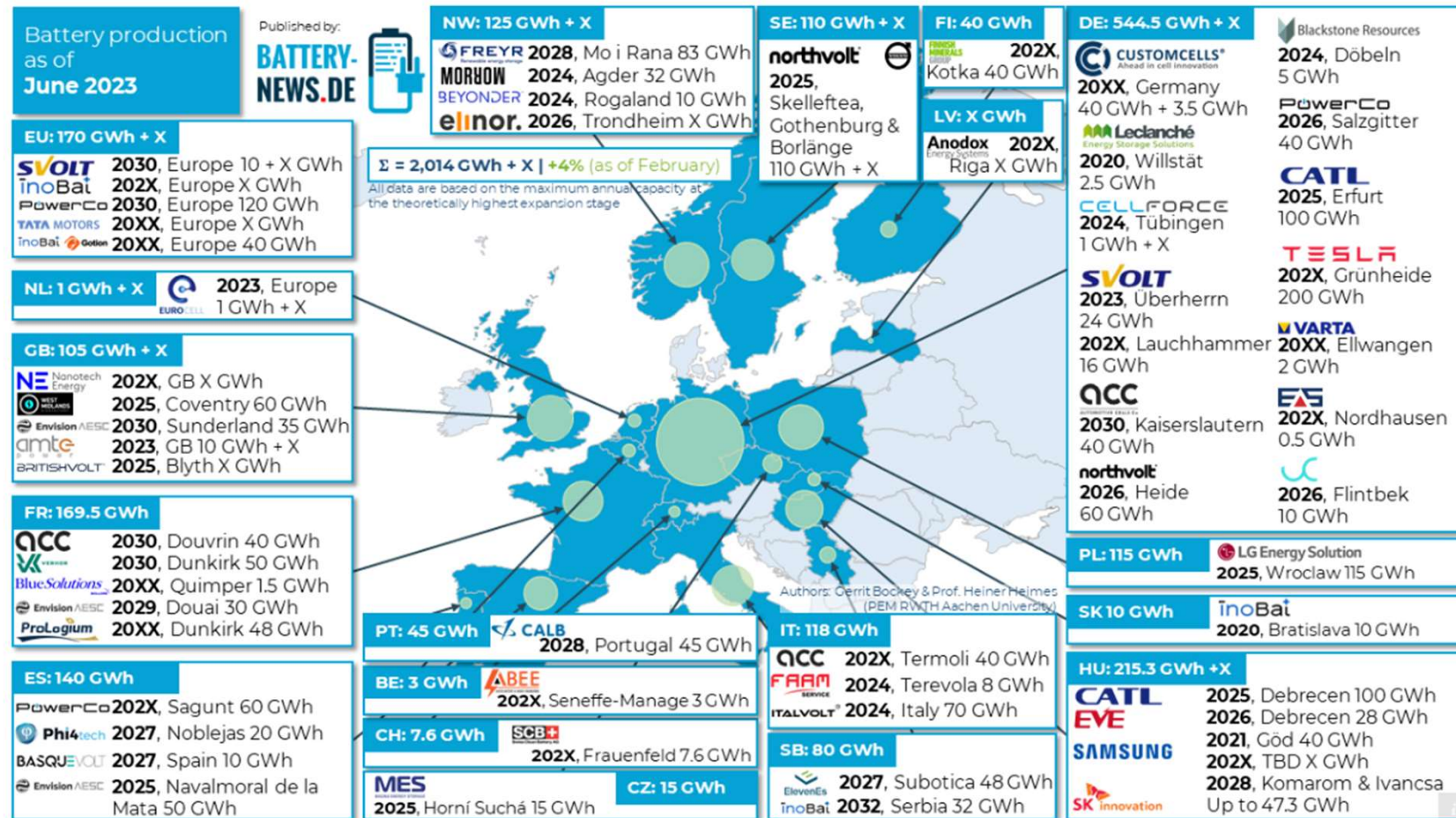


Battery manufacturing Europe (June 2023)

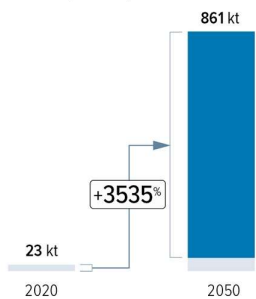


Critical battery materials in Europe

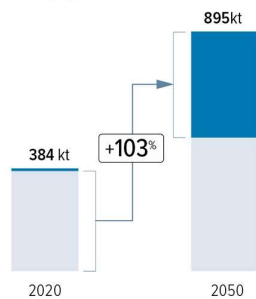
Increasing demand and ways to cover that

Significant supplies of nickel, lithium, and cobalt required to cover future scenarios
 -> Europe will need to develop new recycling capacity

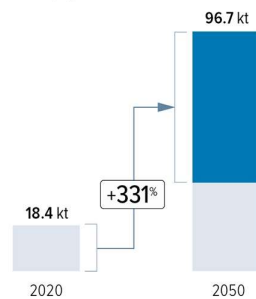
Lithium (kt, LCE)



Nickel (kt)



Cobalt (kt)



Top transition uses (all battery metals):

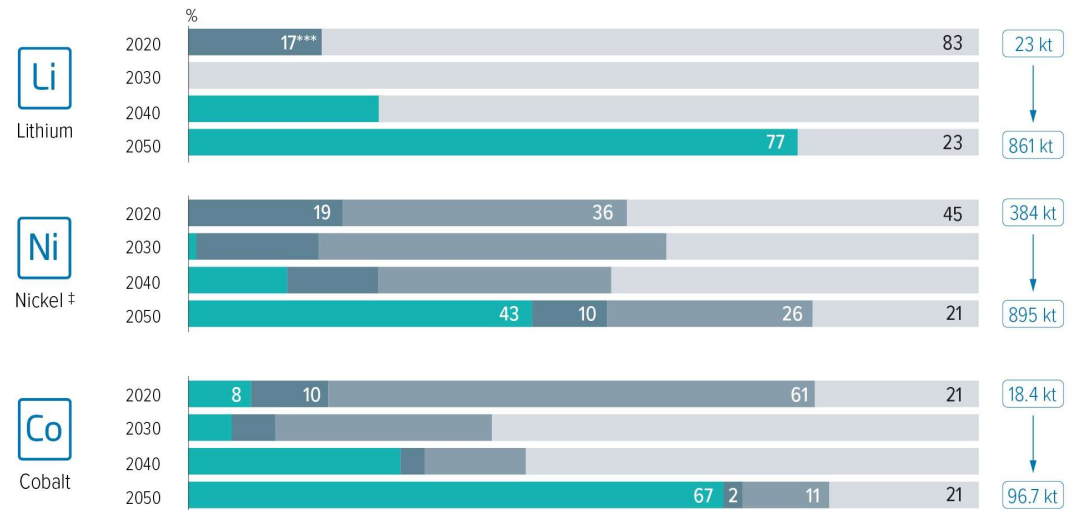


EVs



Battery storage

Legend: Metal from recycling* (teal), Metal from domestic ore (dark blue), Metal from imported ore (medium blue), Imported metal (light blue)



*** This does not represent battery grade lithium, but spodumene destined for the ceramics market
 † Today nickel is recycled as part of stainless steel but not as pure nickel

(<https://www.eurometaux.eu/metals-clean-energy/>)

Critical raw material in batteries (classification according EU)

Copper: anode collector foil, connectors

Graphite (high purity): anode material

Silicon: future anode material (high power density)

titanium: potential anode material

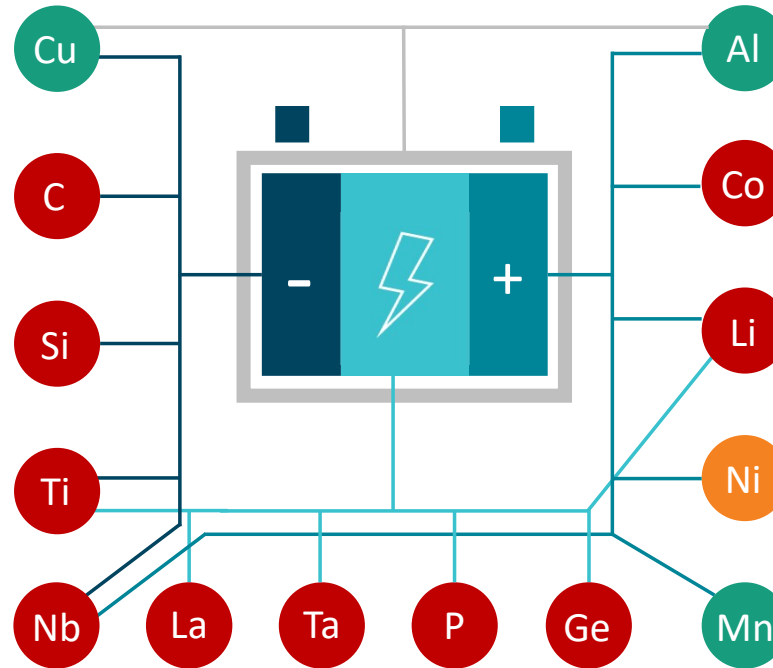
niobium: potential coating in electrodes

lanthium: ceramic electrolyte (LLZO, LLTO)

tantalum: dopant in ceramic electrolyte (LLZO)

phosphorus: solid electrolytes based in phosphate/ thiophosphat-basis (LPS, LGPS, LTP)

germanium: solid electrolyte (LGPS)



aluminium: cathode collector, pouch, NCA

cobalt: cathode active material (NCM, NCA, LCO)

lithium: cathode active material, LiPF_6 , solid electrolyte (LATP, LLZO, LGPS, ...)

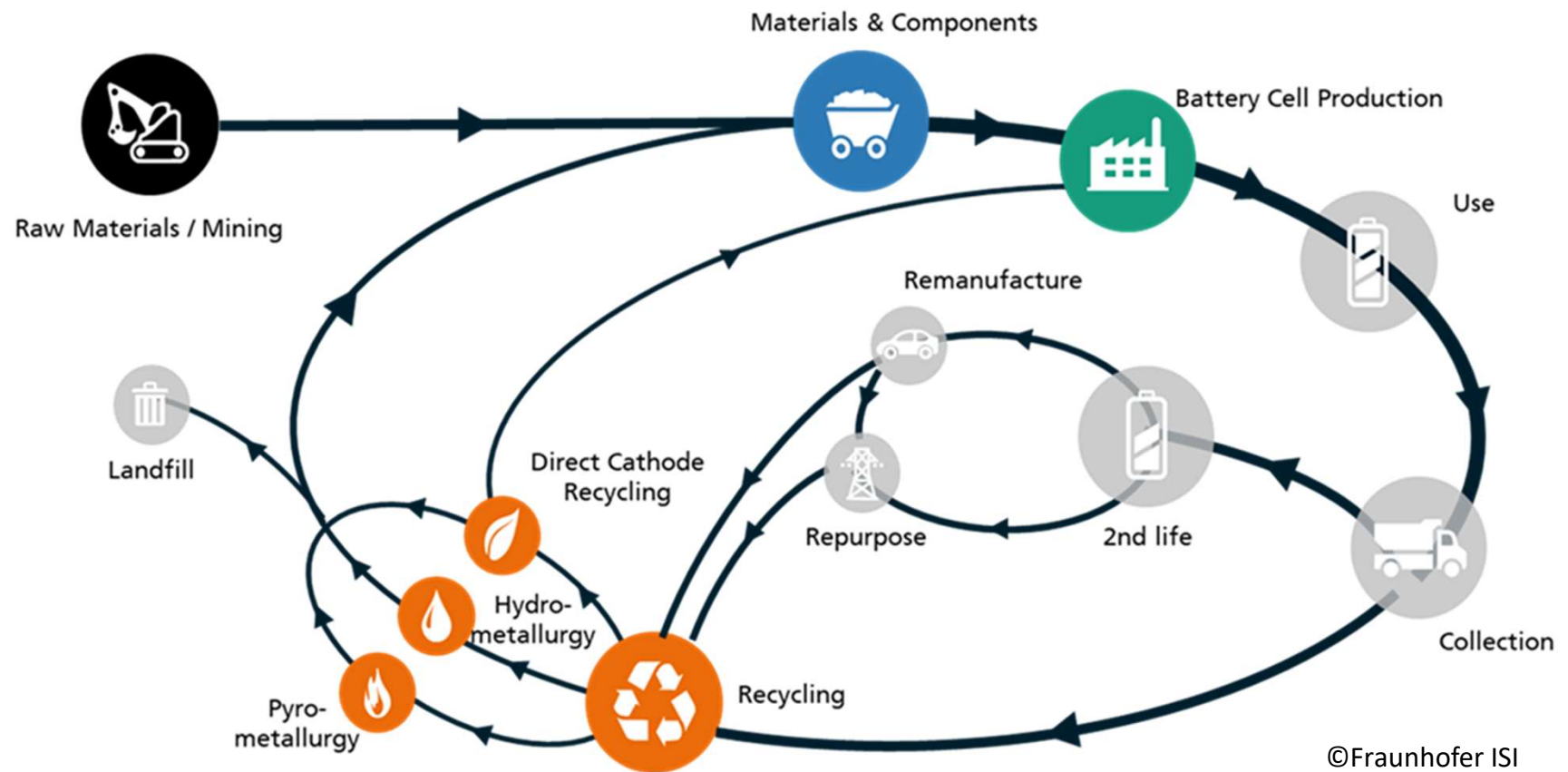
nickel: cathode activematerial (LMO, NCM)

manganese: cathode active material (NCA, NCM)

Adapted: S. Bobba, S. Carrara, J. Huisman, F. Mathieux, C. Pavel, *Critical raw materials for strategic technologies and sectors in the EU 2020*, Publications Office of the European Union, DOI: 10.2873/58081

Efficient use of raw material along the whole value chain

Rethink, Reuse, Repair, Recycle



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Thinking in value chains

