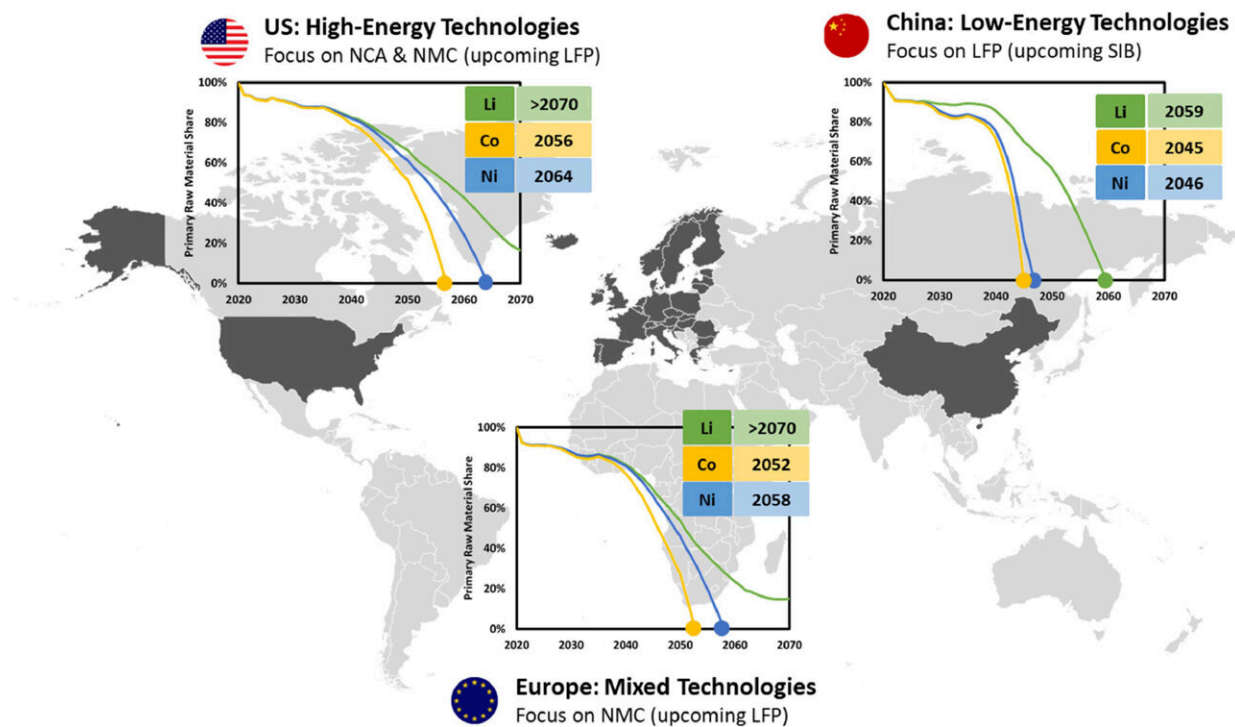


China is ahead of Europe and US in recycling lithium, cobalt and nickel for batteries, finds study

December 8 2023, by Christina Hoppenbrock



Forecasted break-even points (BEPs) of full demand coverage by secondary supply for lithium, cobalt and nickel in China, Europe, and the US. Credit: *Resources, Conservation and Recycling* (2023). DOI: 10.1016/j.resconrec.2023.107218

A team headed by business chemist Prof. Stephan von Delft from the

University of Münster has concluded that China will be the first country worldwide to become independent of the need to mine the raw materials that are essential for batteries. They have also established that this development could be accelerated in all the regions they looked at—including Europe and the U.S.

With the increase in the production of batteries for electric vehicles, demand is also rising for the necessary raw materials. In view of risks to the [supply chain](#), [environmental problems](#) and precarious working conditions which are all associated with the mining and transportation of these materials, the [recycling](#) of battery materials has become an important issue in research, politics and industry.

Prof. Stephan von Delft from the University of Münster heads a team of researchers from the fields of science and the automotive and battery industries who have therefore been investigating when the demand for the three most important raw materials for batteries—lithium, cobalt and nickel—can be met entirely through recycling in Europe, the U.S. and China; in other words, when a completely circular economy will be possible in these regions. The team's conclusion is that China will achieve this first, followed by Europe and the U.S.

In detail, [the results](#) published in *Resources, Conservation and Recycling* show that China is expected to be able to employ recycling to meet its own demand for primary lithium for electric vehicles, obtained through mining, from 2059 onwards; in Europe and the U.S., this will not happen until after 2070. As far as cobalt is concerned, recycling is expected to ensure that China will be able to meet its needs after 2045, at the earliest; in Europe this will happen in 2052 and in the U.S. not until 2056. As regards nickel: China can probably meet demand through recycling in 2046 at the earliest, with Europe following in 2058 and the U.S. from 2064 onwards.

Although earlier research looked at the supply of recycled raw materials for batteries and the demand for them, it had not so far been clear when complete circularity would be achieved, with supply and demand being equal ("break-even point"). The team of researchers also looked at the question of whether there are any possibilities of achieving equilibrium sooner than is predicted by current developments.

"Yes, there are," says Stephan von Delft. "Our research shows that, in particular, a faster rate of electrification in the [automotive industry](#), as is currently being discussed in the EU, will play a role in the process. The reason is that the faster [electric vehicles](#) spread throughout the automotive market, the sooner there will be sufficient quantities of batteries available for recycling."

As Ph.D. student Jannis Wesselkämper adds, "The demand for raw materials could also be met much earlier by recycling as a result of a reduction in battery size and by avoiding a so-called '[second life](#)' for batteries—for example as stationary storage units for solar power."

The researchers made use of a so-called dynamic material flow analysis to calculate both future demand and the recyclable raw materials then available. The data basis the team used consisted of data from current research work and market forecasts regarding developments in battery production and sales and the associated demand for [raw materials](#).

More information: Jannis Wesselkämper et al, A battery value chain independent of primary raw materials: Towards circularity in China, Europe and the US, *Resources, Conservation and Recycling* (2023). [DOI: 10.1016/j.resconrec.2023.107218](https://doi.org/10.1016/j.resconrec.2023.107218)

Provided by University of Münster

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