Future battery cost: Crucial for the success of the mobility and energy transition

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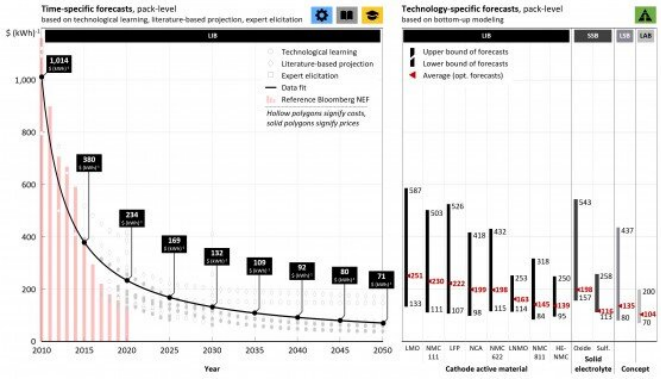
Credit: Unsplash / Michael Marais

For years, there has been a clear downward trend in battery costs. This development is important since batteries, as key components of electric vehicles and stationary energy storage systems, account for the majority of their cost. Today, these products are not yet fully competitive and further battery cost reductions are needed to achieve an economically viable transition to a carbon neutral society. In order to set the right strategic course, accurate battery cost projections are necessary for policy makers and industry. Numerous cost projections for battery systems exist in the academic literature, ranging from below $100 to above $400 per kilowatt-hour for the year 2030. This uncertainty poses a major challenge for the development of efficient incentive schemes for electromobility and for the design of profitable future product portfolios of vehicle manufacturers.

A cross-institutional group of researchers at the University of Münster has now published a comparative study of battery cost predictions from the past decade in the journal *Energy & Environmental Science*. In the study, assumptions from more than 50 scientific publications that analyze the costs of lithium-ion, solid-state, lithium-sulfur and lithium-air batteries, resulting costs are compared and the academic opinion is consolidated into a cost trend.



Overview of time-specific and technology-specific battery cost forecasts from the examined publications. Credit: Mauler et al. (https://creativecommons.org/licenses/by-nc/3.0/)

Academia expects battery cost to continue to fall

The results show an overarching expectation of further declining battery costs, even under pessimistic raw material price scenarios, "Lithium-ion batteries have not yet reached their cost limit. The regression of system cost expectations shows a reduction to $70 per kilowatt-hour by 2050—about half of today's market prices," explains Lukas Mauler from the Institute of Business Administration at the Department of Chemistry and Pharmacy at Münster University and Porsche Consulting GmbH, and lead author of the published analysis. Scientists expect additional cost potentials compared to today, especially through advanced battery materials such as high-energy and high-voltage cathode materials. Further, the studies show that post-lithium-ion technologies, which are not yet commercialized today, have the potential to become economically competitive.

The forecasting of battery costs has many dimensions

Depending on the research question of the examined publications, different drivers of battery costs are included in the assessment. Prof. Dr. Jens Leker, Director of the Institute of Business Administration, explains, "In addition to battery technology, a large number of other criteria are reflected in the cost forecasts. These range from the battery production process, plant location and size, to raw material price scenarios. A significant portion of the forecast variance can be attributed to these assumptions." The present study would bring the required transparency to assess forecast results in a qualified manner. It also contains a navigator that allows researchers to quickly find suitable studies and better understand interdependencies.

The detailed results of the comparative study on battery cost forecasting by Lukas Mauler, Dr. Fabian Duffner, Prof. Dr. Wolfgang G. Zeier, Institute of Inorganic and Analytical Chemistry at the Department of Chemistry and Pharmacy, and Prof. Dr. Jens Leker, Institute of Business Administration at the Department of Chemistry and Pharmacy, have been published as a review article by the Royal Society of Chemistry in the journal *Energy & Environmental Science*.

More information: Lukas Mauler et al, Battery cost forecasting: a review of methods and results with an outlook to 2050, *Energy & Environmental Science* (2021). DOI: 10.1039/D1EE01530C