



Experience Curves for Electrolysis Technologies

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Summary

As government support for the development of green hydrogen technology is increasing rapidly, it is crucial to incorporate research and development expenditures into the calculation of the learning rate of electrolysis technologies. Thus, we develop a two-factor experience curve model with spillovers and economies of scale, which enables us to estimate learning rates for both alkaline and PEM electrolysis technologies using both global- and country-level data from OECD countries. With the dataset over 2000–2022, learning parameter estimates were incorporated into the well-established progress equation, estimating global learning-by-doing rates of 17.5%–46.8% and global learning-by-researching rate of 9%–42.3% for electrolysis technologies. When technology spillovers are allowed, we find a linear relationship between PEM technology and alkaline technology improvements.

Based on our OECD cross-country dataset, which includes more observations, we estimate learning-by-doing to be 0.6%–9.4% and learning-by-research to be 4.0%–19.9%. Furthermore, the cost of electrolysis at the national level decreased by about 28 percent for the sample period 2000–22 as a result of global experience. Hence, our empirical results indicate that technology-push measures are still essential to reduce the cost of electrolysis technologies. Furthermore, the absorptive capacity of a country should be improved to maximise the spillover of global learning.

This improvement can be achieved by establishing global pipelines for the products of local electrolysis technology manufacturers and strengthening the global network ties of local manufacturers. Since reliable estimates of learning rates are necessary for developing trustworthy technology forecasting, we recommend that key private and public sector energy stakeholders consider RD&D spending and technology spillover as essential factors in anticipating the evolution of technological change for electrolysis.

Keywords: Green hydrogen technology; experience curves; RD&D spending; Global and OECD; cost reductions

JEL Classification: O30, C50, Q42, Q55