

A System Dynamics Approach to Technological Learning Impact for Cost Estimation of Solar Photovoltaics

Authors : Rong Wang, Sandra Hasanefendic, Elizabeth von Hauff, Bart Bossink

Abstract : Technological learning and learning curve models have been continuously used to estimate the photovoltaics (PV) cost development over time for the climate mitigation targets. They can integrate a number of technological learning sources which influence the learning process. Yet the accuracy and realistic predictions for cost estimations of PV development are still difficult to achieve. This paper develops four hypothetical-alternative learning curve models by proposing different combinations of technological learning sources, including both local and global technology experience and the knowledge stock. This paper specifically focuses on the non-linear relationship between the costs and technological learning source and their dynamic interaction and uses the system dynamics approach to predict a more accurate PV cost estimation for future development. As the case study, the data from China is gathered and drawn to illustrate that the learning curve model that incorporates both the global and local experience is more accurate and realistic than the other three models for PV cost estimation. Further, absorbing and integrating the global experience into the local industry has a positive impact on PV cost reduction. Although the learning curve model incorporating knowledge stock is not realistic for current PV cost deployment in China, it still plays an effective positive role in future PV cost reduction.

Keywords : photovoltaic, system dynamics, technological learning, learning curve

Conference Title : ICARET 2023 : International Conference on Advances in Renewable Energy Technology

Conference Location : Amsterdam, Netherlands

Conference Dates : December 04-05, 2023