

ENERGY FINANCE

Learning in the financial sector is essential for reducing renewable energy costs

Financing costs for renewable energy technologies have decreased substantially over the past 18 years, helping make renewables more cost competitive. Leveraging the effect of financial learning and continuing the policies that facilitated favourable financing conditions are key for greater renewable energy adoption in the future.

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BASED ON F. Egli et al. *Nature Energy* <https://doi.org/10.1038/s41560-018-0277-y> (2018).


The policy problem

Achieving the goals of the Paris Agreement requires significant continued reduction in the cost of renewable energy. Ambitious policies have already led to large reductions in renewable energy cost. These reductions are often attributed to a reduction in hardware cost but the role of financing conditions and trends has remained largely unexamined. As renewable energy costs approach grid parity, it is increasingly important to understand how and why financing conditions changed over time. While individual investors know their cost of capital, typically this information remains unavailable to policymakers. Such information can inform decisions about when and how to phase out remuneration schemes such as feed-in tariffs or auctions.

The findings

We find that financing conditions improved greatly for solar photovoltaics (PV) and onshore wind energy in Germany between the introduction of the feed-in tariff in 2000 and 2017. During this period, the cost of capital decreased from 5.1% to 1.6% for solar PV and from 4.5% to 1.9% for onshore wind. These reductions stem from two effects. First, a strong reduction in the general interest rate level, following the financial crisis. Second, a reduction of debt margins, due to increased investment experience with renewable energy technologies.

The study

We compiled a novel dataset on the financing conditions of 133 representative German utility-scale renewable energy projects undertaken between 2000 and 2017. We combined this with qualitative interviews with 41 investment professionals to understand the underlying drivers of change in financing conditions. This allowed us to disentangle the cost-reducing effect of lower interest rates from the cost-reducing effect of experience in the renewable energy financing industry (Fig. 1). 

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Messages for policy

- The learning process in the renewable energy finance industry helps speed up the energy transition.
- Renewable energy investment policies should aim at attracting a broad spectrum of investors in order to create competition that drives down financing cost.
- State investment banks with a 'green' mandate prove useful to build investor confidence in new technologies.
- Renewable energy deployment should be safeguarded against potential interest rate hikes, as these can disrupt financial learning and reverse cost reduction trends.

Further Reading

Schmidt, T. S. et al. Adverse effects of rising interest rates on sustainable energy transitions. *Nat. Sustain.* **2**, 879–885 (2019).

Quantifies how general interest rate increases would affect the viability of renewable versus fossil-fuel electricity and proposes a safeguarding policy strategy.

Noothout, P. et al. *The Impact of Risks in Renewable Energy Investments and the Role of Smart Policies Final Report* (DiaCore, 2016).

Offers a comprehensive collection of the cost of capital data for wind onshore projects in the European Union (26 countries) combining model results with expert interviews.

Geddes, A., Schmidt, T. S. & Steffen, B. The multiple roles of state investment banks in low-carbon energy finance: an analysis of Australia, the UK and Germany. *Energy Policy* **115**, 158–170 (2018).

Draws on 52 interviews and focuses on three state investment banks to distill five roles these banks take to accelerate financial sector learning.

Polzin, F., Egli, F., Steffen, B. & Schmidt, T. S. How do policies mobilize private finance for renewable energy?—A systematic review with an investor perspective. *Appl. Energy* **236**, 1249–1268 (2019).

Offers a comprehensive overview of the empirical evidence on the effectiveness of renewable energy policies in attracting investment with

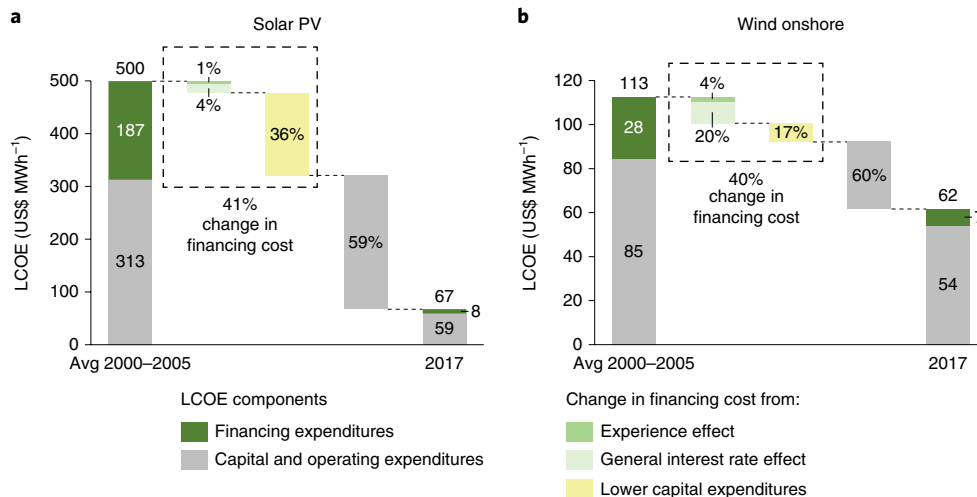


Fig. 1 | The impact of lower interest rates and financial learning on the cost of renewable energy. a,b, Contribution of different effects to solar PV (a) and wind onshore (b) levelized cost of electricity (LCOE) reductions in Germany. The experience effect refers to investors providing lower cost financing due to increased investment experience with the technology. The general interest rate effect refers to the economy-wide interest rate decline. Lastly, financing costs are also lower because the capital expenditure (initial investment cost) per MW has decreased for both technologies. Avg, average. Reproduced from Egli, F., Steffen, B. & Schmidt, T. S. *Nat. Energy* **3**, 1084–1092 (2018); Springer Nature Ltd.

a deep dive into the design of auctions, feed-in tariffs and renewable portfolio standards.

Steffen, B. The importance of project finance for renewable energy projects. *Energy Econ.* **69**, 280–294 (2018).

Shows that renewable energy projects heavily rely on non-recourse project finance, including in low-risk countries like Germany, using a financial structure that allows a broad set of (non-utility) sponsors to invest in renewable energy.

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Competing interests

The authors declare no competing interests.