Cost of capital for small-scale low-carbon technologies

Themenbereich: Klima- und Energiestrategie in Österreich & Nachbarländern
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Motivation and research question

Costs of capital (CoC) is a significant investment variable influencing the feasibility of low-carbon technologies [1], [2]. Until now, research has mainly focused on CoC and financing for utility-scale solar PV, onshore wind, and offshore wind [3]–[5]. However, countries like Switzerland and Austria, with their distinctive Alpine geography, high population density, and limited space for utility-scale projects, will have to rely to a greater extent on small-scale RE like rooftop PV, biomass plants, heat pumps, and district heating grids to decarbonize. We study the CoC for small-scale renewable energy investments, focusing on Switzerland as a case study.

Methodology

Our methodology consists of three steps. First, we undertook a desktop review of Switzerland's current and planned renewable energy investments to identify relevant RE markets and technologies. Second, we have conducted 20 semi-structured interviews with financing professionals in Switzerland regarding their Swiss investments, RE business models, and risk drivers. Third, we used an online survey to elicit the interviewee's technology-specific estimate for the weighted average cost of capital (WACC) relating to the start of 2022 and before the Ukrainian war. Besides this, we also asked the interviewees to provide their estimates for debt financing conditions. Finally, we also used the survey to map out the technology-specific financing structures and debt sources– for instance, project financing versus balance sheet financing and corporate loans versus bond issuance.

Results and conclusions

The intermediate qualitative and quantitive results show a significant difference in average capital costs between technologies in Switzerland. First, regarding CoC values, smaller solar PV plants (up to 100 kW) have the smallest WACC averaging 3%, due to their lower technology risks and established business models, such as energy contracting. In contrast, onshore wind projects would require WACCs of 6%, while hydrogen production via electrolysis would require WACCs of 8.3%. Second, our results indicate to considerable variation in financing types and debt sources. Investors usually finance larger projects, such as onshore wind plants and biomass, via project financing and bank loans. In contrast, smaller projects such as rooftop solar PV, heat pumps, and district heating networks are usually financed via balance sheets and a combination of household savings, bond issuance, and corporate loans. Third, we demonstrate the difference between the CoC of different kinds of investors. For instance, Swiss utility companies typically have CoC that are between 1 and 1.5% higher than those of project developers and long-term financial investors such as pension funds. In conclusion, our study highlights the significant impact of technology risks on CoC and the diversity of financing structures, implying the need for tailored support policies.

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