THE IMPACT OF DE-RISKING FINANCING AND COSTS OF CAPITAL ON SUPPORT COSTS FOR ONSHORE WIND AND SOLAR PV IN EUROPE

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Overview

Capital expenditures make up a major share of renewable energy projects and unlike conventional power generation technologies, their operational expenditures are small. Considering this, the cost of electricity from renewable energy technologies is very sensitive to changes in costs of capital (CoC) (Hirth and Steckel, 2016). Therefore, de-risking could significantly reduce their generation costs and make them price competitive with conventional power plants (Schmidt, 2014). Governments employ support policies to help renewable energy investors achieve value-generating projects, whose rates of return are greater than the CoC they used to finance the investment (Pratt and Grabowski, 2014). While EU Member States until recently mainly employed support schemes in which the government set remuneration levels - such as Feed in Tariffs (Kitzing et al., 2012) - legislative changes including EU State Aid Guidelines (European Commission, 2014) and the revised Renewable Energy Directive (European Commission, 2016), ushered a transition of EU support policies to auctions and feed in premiums (Szabó et al., 2020).

In this study, we investigate the impact of de-risking on support costs by calculating minimum economically viable bids within existing auction frameworks for onshore wind in 22 and solar PV in 12 EU member states. To estimate the impact of de-risking on support costs, we use data on CoC and financing conditions from a survey with 80 financing experts and project developers (Roth and Brückmann, 2020). The survey yielded 187 project specific and countrywide estimates on project financing conditions in EU27 and UK, including inputs on costs of debt, costs of equity, DSCR requirements and loan tenors. We estimate the potential of de-risking to reduce support costs, by varying the financing inputs to their best in country and technology specific surveyed values, and compare this with the effects of changing other investment and market variables. Finally, we discuss the effectiveness of policy solutions to de-risk support schemes and derive policy recommendations.

Methods

To quantify baseline support costs, we developed a cash flow optimization model, which minimizes bid levels, while sculpting a debt repayment schedule and deriving project CoC. The model generates support costs as the difference between the required minimum bids and assumed capture prices for onshore wind or solar PV, while simulating cash flows for three generalized remuneration scheme types including two-sided Contracts for Difference (CfD), one-sided sliding premium and fixed premium. After investigating the existing schemes, we divide the countries among these three remuneration types, to make the results comparable.

The surveyed financing data contained minimum and maximum range values for each eastimate. After treating the data, we derive 561 project financing scnearios consisting of worst, average and best inputs for each of the 187 estimates. We complement this with country and technology specific investment inputs, and auction designs that we derived from an auction database (Anatolitis and Hanke, 2020), containing data from the most recent auction rounds for onshore wind and solar PV in Europe.

After quantifying support costs for all of the 561 project financing scenarios, we estimate the potential effect of de-risking by varying the project financing inputs for each scenario to their best country and technology-specific value. To understand the significance of debt and equity de-risking, we compare the magnitude of their impact with the effects of varying CAPEX, O&M, capacity factors and electricity prices. While this enabled us to obtain general results for a larger number of countries, the actual effects of de-risking differ on a country level. To understand these differences, we deepen the analysis by developing a waterfall model and investigating in detail support cost reductions for onshore wind in UK, Denmark, Germany and Greece.

Results

We highlight the following general findings: **1)** compared to the country baseline values de-risking debt financing would lead to largest support-cost savings, equaling to a 53.1% reduction on average or 3.3 EUR/MWh over lifetime

2) in comparison de-risking costs of equity would yield an average support cost reduction of 33.6% or 1.9 EUR/MWh **3)** in terms of other debt financing conditions, improving loan tenors would on average reduce support costs by 18% or 1.16 EUR/MWh, while DSCR only 8% or 0.43 EUR/MWh. Other investment variables also have significant impacts on support costs. Increasing capacity factors by 10% exhibits on average almost the same support costs savings as improving all debt financing conditions, while the effect of decreasing CAPEX values by 10% is slightly less. Moreover, an electricity price trend of 2% increase per year instead of the 1% that we assume in our baseline, would on average have a greater impact than de-risking debt financing. On the other hand, changes in O&M levels seem to have a smaller and insignificant effect on support costs. Examining the effects in Greece, Denmark, UK and Germany more closely, yields slightly different conclusions that deepen the analysis. As shown in Figure 1, de-risking debt in Greece would lead to a reduction in support costs of 7.08 EUR/MWh – more than double the average – while in Denmark de-risking debt would yield a reduction of only 2.32 EUR/MWh. As Roth at al. (2021) point out, countries like Greece and Denmark have highly different domestic financial markets and their country risk varies greatly.

From a theoretical viewpoint, introducing a revenue stabilization mechanism like Contracts for Difference might lead to largest revenue stabilisation (May et al., 2018) since their two sided nature leads to higher shares of secured revenues and enables the bank to project the loan repayment schedule with less uncertainty. However, we do not find that countries with CfD schemes have lower WACC levels than those with sliding and fixed premiums. Although Greece applies a CfD scheme, its average calculated WACC is 2.7% higher than Denmark's that applies a fixed premium, which is mainly due to the differences in country risk premiums. While revenue stabilisation could help attract investors with lower equity return requirements such as pension funds and insurances (Salm, 2018), it's questionable if other de-risking measures could induce reductions in costs of equity. As Đukan and Kitzing (2021) show, stringent bid bonds, penalties and material pre-qualifications mainly discourage bidders from participating in an auction, rather than causing them to respond to higher perceived bidding risk with increasing their equity return requirement.

Conclusions

These findings lead to several conclusions and policy implications: **1)** de-risking mechanisms like revenue stabilisation through a CfD scheme, could enhance the overall investment climate and improve financing conditions and costs of capital in general **2)** however, financing conditions depend primarily on wider macroeconomic conditions, especially in higher risk countries like Greece that experienced large economic stress during the Eurozone debt crisis **3)** de-risking equity financing would have a lesser impact on support cost reductions and as Đukan and Kitzing (2021) indicate would most likely not affect the bidders' costs of equity, but rather remove auction participation barriers. Therefore, policymakers should implement these measures mostly if their main goal is to increase auction participation of smaller bidders like community energy organisations **4)** support costs might decline in the future due to an increase in electricity prices or further improvements in technology capacity factors and decrease in their costs. Therefore, policymakers should view de-risking as a complementary mechanism that will enable societies to accelerate the energy transition

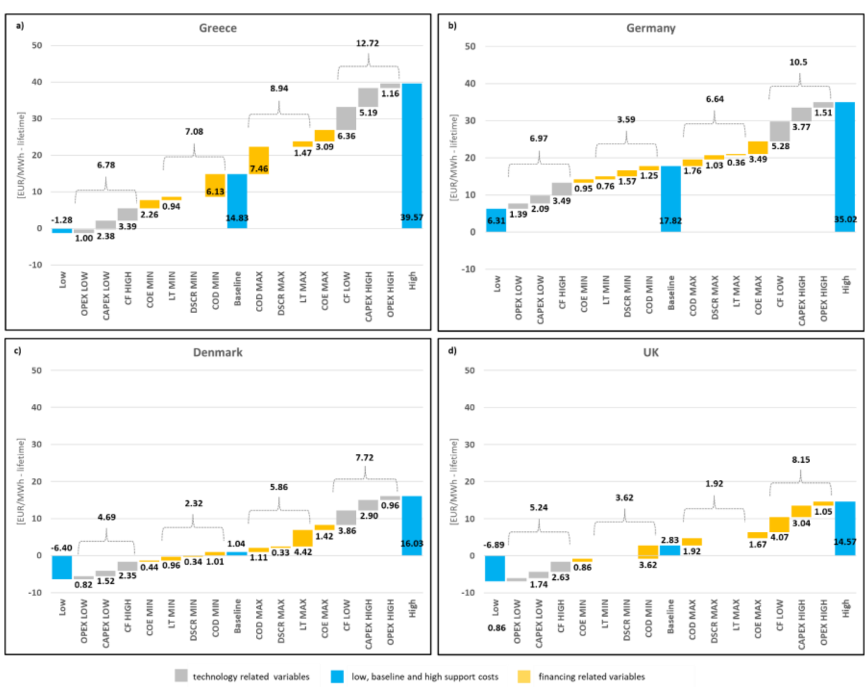

Figure 1: Effects of de-risking individual elements of cost of capital and financing in Greece, Germany, Denmark and UK