A NOVEL APPROACH FOR SUPPORTING THE STRONG UPTAKE OF WIND ENERGY IN AUSTRIA

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Overview

This paper informs on a novel concept for supporting a strong uptake of wind energy at short notice in a country where site-specific wind conditions differ and where the topography may also affect corresponding cost. That approach shall allow the proper functioning of the auction scheme used for allocating related support and investments.

As several other countries around the globe, for combating climate change Austria aims for a strong uptake of electricity generation from renewable energy sources (RES) within this decade. In the Renewable Energy Sources Expansion Act (EAG) adopted in July 2021 the Austrian Federal Government postulated an ambitious target for the domestic expansion of RES: The goal is to generate electricity by 2030 to the extent that the national total electricity consumption is covered 100% (at a yearly balance) from renewable energy sources. Despite the fact that Austria has already achieved a high RES share, i.e. 78% by 2020 [1], with this goal, the country's energy system, and specifically the power system, faces a significant transformation. Wind energy shall act here as one of three key pillars to let that vision become a reality. An uptake by 10 TWh is planned for wind energy within this decade, implying more than a doubling of installed capacities compared to the status quo.

Despite current (as of March 2022) high energy prices that generally increase the viability of investments in renewables, a strong policy framework is required to safeguard the transformation process planned. In line with EU guidelines for state aid in the energy sector, the EAG stipulates operational support for RES to be provided in the form of a market premium. A market premium is a subsidy on the electricity fed into the public grid, which is intended to compensate for the higher production costs of renewable electricity. Market premiums are mainly awarded in the EAG on the basis of auctions – an instrument that has generally proven to be efficient for allocating RES investments if certain criteria are met. Since ensuring sufficient competition on the bidder side is among that criteria list, a challenge may arise under the given circumstances within Austria. Specifically for wind energy (but also for other RES like photovoltaics) the postulated target is ambitious and so are the auction volumes whereas the available resource potential appears comparatively limited. For tackling this challenge, policy instruments and specifically the auction scheme needs to be designed with care. This paper presents an attempt for doing so in the case of wind energy. Building on lessons learnt from other countries, a novel concept has been derived to differentiate support in accordance with local needs, considering differences in site-specific wind conditions and related electricity infeed. This may attract investments not only at the best sites but also at, at first glance, less attractive locations that are however needed to meet the given ambitious policy target.

This concept has been derived by the authors as part of a study commissioned by the Austrian Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology (BMK) – for details see [2]. More precisely, Technische Universität Wien (TU Wien), Energy Economics Group, in cooperation with the Austrian Institute of Technology (AIT) and the Fraunhofer Institute for Systems and Innovation Research, was commissioned to prepare an expert opinion on operation- and investment subsidies within the framework of the EAG. The expert work included the development of recommendations regarding the operation and investment support of electricity generation from RES, and specifically for wind energy, to develop a scheme that respects the legal provisions of the EAG while ensuring effectiveness and economic efficiency of that policy intervention.

Methods

The expert statements, analyses, calculations and recommendations are based on the legal requirements of the EAG, which came into force on July 28, 2021 after the resolution and adoption in the National Council and Federal Council. A comprehensive literature analysis formed the basis for the clarification of central issues and the making of recommendations, with a great deal of attention being paid to the consideration of experiences at national and international level. Furthermore, there were also conceptual considerations in order to develop and evaluate options with regard to the design of various funding regulations. In a further task, the impact of current (as of March 2022) high prices on commodity and energy markets has been analysed and incorporated in funding reommendations.

A specific feature of wind energy related to the requirement of the EAG for location differentiation of the funding regulations. The EAG stipulates that, in the case of wind energy, a correction factor that reflects the site-specific differences in wind conditions and related yields. According to paragraph 43 of the EAG, the correction factor is to be defined as a surcharge or deduction on the value to be applied for a standard location. The standard location must

reflect the average electricity yield of a state-of-the-art wind turbine installed in Austria. In the course of the study, it was necessary to implement the relevant specifications in the development of the funding recommendations for wind energy. Initially, different options for location differentiation were subjected to a brief assessment. Furthermore, representative sample projects provided by industry representatives were analyzed in order to identify key influencing factors of the future costs of electricity generation from wind energy in Austria. The analysis revealed the expected strong correlation between the quality of the site, represented by the mean wind speed, and the levelized cost of electricity (LCOE). An analogous connection could be identified between the rotor area-specific electricity yield and LCOE, since wind speed and specific yield usually correlate well. The assessment of funding practice in other countries confirmed the above. Thus, the authors continued to pursue this approach and developed a corresponding funding model. The recommended model for location differentiation on the basis of rotor area-specific production yields is presented briefly in the results section. As additional element a model extension has been developed for acknowledging yield specifics dependent on altitude, an important feature given Austria's topography where mountainous areas complement the flat terrain.

Results

In the basic principle, the real electricity yields of a wind turbine are used to determine the subsidy rates (i.e. as part of the market premium subsidy to determine the correction factor for the default award price). In concrete terms, the electricity yields of a wind turbine determined on an annual basis are set in relation to the rotor circle area, i.e. the area swept by the wind. This results in the rotor area-specific electricity yield (in kWh/m^2). If this value is high, this indicates a high quality of the location, which usually implies low LCOE. If, on the other hand, it turns out to be low, this reveals a lower quality of the location and, as a result, higher LCOE. The information obtained in this way is used to differentiate the subsidy rates so that needs-based funding is possible. Locations with a lower quality receive higher subsidy rates and vice versa.

The anchor point here is the reference to a standard location, i.e. the comparison of the actual, measured, rotor-area-specific yield of a wind turbine with the representative standard value. The standard value describes the yield that a state-of-the-art wind turbine installed in Austria could achieve at an average location (standard location) in terms of suitability for wind energy. The location-specific differentiation of the subsidy rates takes place on an annual basis by means of correction factors, i.e. by surcharges or deductions to the basic award price which reflects the LCOE of a standard system at the standard location. In order to ensure that project developers strive for cost efficiency and thus prefer the best possible wind locations when choosing a location, a slight increase in the correction factors for all locations that are better than the standard location was applied (cf. Fig. 1).

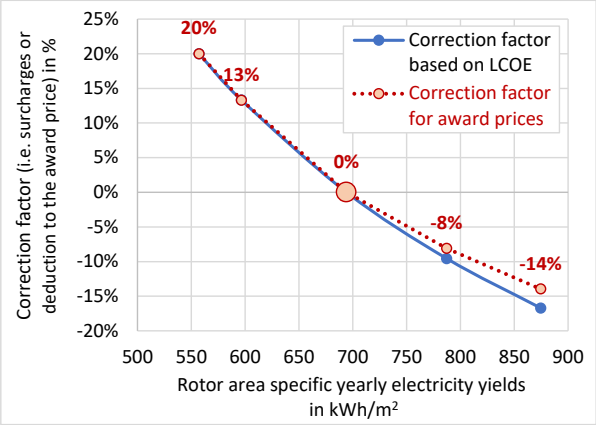

Fig. 1. Correction factors to the basic award price for wind energy according to the developed funding concept

Conclusions

The derived novel concept appears highly suitable for supporting a strong uptake of wind energy at short notice in a country where site-specific wind conditions differ and where the topography may also affect corresponding cost. The approach shall allow the proper functioning of the auction scheme used for awarding support to planned projects. It aims for increasing competition on the investor side by encouraging wind development not only limited to best sites.

A plausibility check of the developed funding model has been carried out in the course of the study, on the one hand, based on generic data on state-of-the-art wind turbine types and, on the other hand, on the basis of the information provided by the industry on representative sample projects for the future wind power expansion in Austria. Both tests confirmed the high suitability of the developed funding model in terms of suitability for location differentiation in Austria. The ultimate test of the derived concept is planned for autum this year when the novel concept shall be put into (auction) practice within Austria.

References

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[2] Resch G. et al., "Gutachten zu den Betriebs- und Investitionsförderungen im Rahmen des Erneuerbaren-Ausbau-Gesetzes" (in German). Available at: https://www.oemag.at/fileadmin/user_upload/Dokumente/Veroeffentlichungen/ EAG_Gutachten_Endbericht_Stand_15_Nov_2021.pdf. [Accessed 02 2022]