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FEED-IN TARIFFS AND THEIR IMPACT ON THE MARKET PARTICIPANTS' OPTIMAL CAPACITY CHOICE

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ABSTRACT

Promoting the use of renewable energy sources (RES) is a central goal of the European Union, which was recently corroborated in directive 2009/28/EC. RES can be supported with either price- or quantity-based policies. Feed-in tariffs, a price-based policy, are the most commonly used support schemes and are also considered to be "the most efficient and effective support schemes for promoting renewable electricity" [1]. The fundamental characteristic of feed-in tariffs is a guaranteed price for the production of electricity that covers the long-term marginal costs of RES [2]. Such a support scheme has led to a massive development of RES in Germany and several other countries. In this paper we do not challenge the general efficiency or effectiveness of feed-in tariffs but we show a shortcoming of such support schemes that comes along with the linkage of the tariff and the "priority feed-in", which implies that the tariffs are paid for the actual production of electricity. Once the price for electricity drops below the short-term marginal costs of RES it is not socially optimal to produce electricity from RES. Thinking about solar- and wind power plants, this may not be of importance in times of positive prices for electricity. However, when negative prices occur this is of particular relevance. Any institutional or financial priority feed-in of electricity from RES leads to a loss of welfare. This is shown by figure 1 in terms of a comparative-static analysis with inelastic demand, RES supply with constant marginal costs c_{RES} and an increasing cost function for conventional supply.

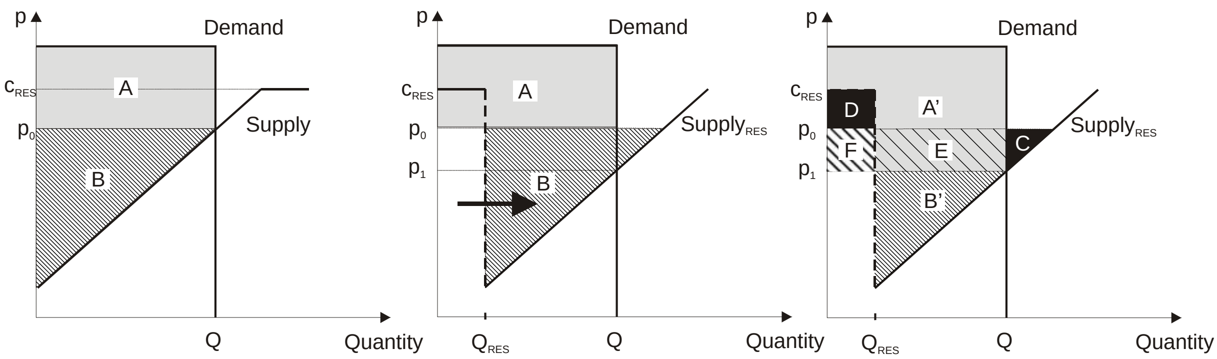

Figure 1: Static welfare loss with priority feed-in. Source: Andor et al. 2010 [3].

Consumers' surplus is shown by area A, producers' surplus is represented by area B. By means of the priority feed-in the RES supply (denoted with Q_{RES}) is dispatched before the conventional supply and the conventional supply is pushed to the right (figure 1b). Due to an expanded supply and unchanged demand a part of the conventional supply is pushed out of the market. These suppliers lose their economic surplus, represented by area C in figure 1c. This is a welfare loss, resulting from the crowding out of productive supply. Hence the priority feed-in leads to allocative inefficiency. In addition, marginal costs of the RES technology c_{RES} lie above the value of electricity, which is p_0 (i.e. the price that results in a free market, which is *not* p_1). Now electricity is produced at a higher price than there is economic value and resources are spoiled. Thus we have an additional welfare loss, represented by area D. The overall welfare loss, which is shown by areas C and D, originates from the fact that due to the priority feed-in an (in this particular situation) inefficient technology is pushed into the market.

In the next step we want to analyze the outlined field in a dynamic context: The priority feed-in definitely changes the rules of the game. Market participants will react on these changes by adapting their optimal capacity. An altered installed capacity naturally alters the supply function and thus the above shown welfare losses. Using methods from industrial economics, we will investigate how the adaption of capacity is accomplished dependent on the assumed market setting. The welfare loss shown by area C in figure 1c may diminish in the long run but, on the other hand, marginal costs of production will change, which again has an influence on the overall social welfare.

Subsequently, we will constitute policy recommendations by showing how to reduce welfare losses by modifying the design of feed-in tariffs.

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