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Combinations of support instruments for renewable electricity in Europe: A review

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ABSTRACT

The aim of this paper is to review the combinations of RES-E support instruments in the European Union (EU), using different sources of data. It is shown that combinations are indeed a widespread phenomenon in the EU Member States. Not much attention has been paid to the combinations of primary instruments with other secondary instruments for the same renewable energy technology. It is found that the most frequent mixes of instruments are between feed-in laws (feed-in tariffs, and increasingly feed-in premiums), on the one hand, and investment subsidies, soft loans and tax incentives on the other. In a broad sense, the policy mix between primary and secondary instruments has experienced some changes over the last decade, mostly related to changes in the primary instruments themselves. Exclusion (i.e., ineligibility to apply for an instrument when the RES-E generator is already being financially supported by another instrument) and explicit coordination of support under primary and secondary instruments do not seem to be common elements in these policy combinations.

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1. Introduction

The abundant literature on support schemes for electricity from renewable energy sources (RES-E) has mostly focused on the comparison between two primary instruments: feed-in laws and quotas with tradable green certificates (TGCs) (see [1] for a review). It is widely recognised now that this debate is outdated and that the success of policies for RES-E support depends as much on the instrument chosen as on the design details of instruments and the context of their implementation [2,3]. In addition, the combinations, for the same technology, of those primary instruments with other secondary instruments (including investment subsidies, soft loans and fiscal incentives) have not received a comparable attention. This topic is certainly not analysed in highly relevant policy documents such as the policy chapter in the Intergovernmental Panel on Climate Change (IPPC) Report on Climate Change and Renewables [4], the International Energy Agency (IEA) Report on Policies for Renewables [5] or the European Commission guidance for the design of renewables support schemes [6]. Ref. [7] provides a graphical analysis of the advantages of combining different instruments and represents an exception in this context.

This lack of analysis of instrument combinations occurs despite the fact that most countries with renewable energy policies around the world have implemented more than one type of instrument [8,9]. In the EU, RES-E deployment instruments are combined either across technologies or for the same technology (see Section 3). How to

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combine RES-E support instruments in order to promote the deployment of RES-E cost-effectively is a relevant issue for governments, at least in the European Union (EU), where targets for the penetration of renewable energy in energy consumption have been set for 2020. According to Directive 28/2009/EC [10], renewable energy should contribute to 20% of energy consumption in the EU in 2020. The recent communication from the Commission on January 22nd 2014 proposes a 27% renewable energy target for 2030 [11]. In addition, it is a relevant issue for the EU itself. In the recent European Commission Guidelines on State aid for environmental protection and energy 2014–2020, it is stated that "aid may be awarded concurrently under several aid schemes or cumulated with ad hoc aid, provided that the total amount of State aid for an activity or project does not exceed the limits fixed by the aid ceilings laid down in these Guidelines" [12]; p. 27, number 81. The aim of this paper is to review the combinations of those instruments in the EU Member States (MS), using different sources of data.

Combinations of instruments can be justified to account for the coexistence of market failures and/or barriers to achieve certain policy goals. If there are multiple market failures to the uptake of RES-E, combinations of instruments would make sense if a single instrument cannot tackle all those failures simultaneously and each failure can only be appropriately addressed by one instrument [4,13–15]. This follows Tinbergen's dictum that multiple market failures require multiple instruments [8]. In the real world, however, the combination of instruments might also be related to political economy factors, i.e. to the influence of a given stakeholder group [16].

The analysis of combinations of instruments has been the focus of much research in the climate and energy policy literature (see, e.g., [14,15,17] for reviews). These combinations have been investigated for the same technology over time (i.e., sequentially) as well as simultaneously for different technologies but, as mentioned above, not simultaneously for the same technology. Following the above-mentioned justification, the literature generally supports the combination of several instruments.

The combination of primary instruments with secondary instruments could be regarded as an attractive option by policy-makers in order to promote RES-E effectively and efficiently. An instrument is said to be effective if it is able to achieve a significant RES-E deployment or a certain RES-E target [1]. Cost-effectiveness refers to the achievement of a given RES-E target at the lowest possible cost to society.

Combinations of instruments have often been justified based on the effectiveness criterion [18]. For example, while FITs provide a stable revenue flow for investors, and have proven very effective to trigger RES-E investments, investment subsidies and soft loans may further encourage investments by reducing the costs of financing, which might be a main barrier to the deployment of RETs [19]. This is because investment-related costs represent the main electricity generation costs for RETs. Their relatively high capital-intensity leads to high funding requirements. However, combinations of instruments may also lead to conflicts, resulting in inefficiencies, redundancies, double coverage or double counting [20]. It is not the aim of this paper to analyse the advantages and drawbacks of instrument combinations, neither in general nor for specific countries but to identify how primary and secondary instruments have been combined in the EU MS.

Accordingly, this paper is structured as follows. Section 2 describes the main instruments for RES-E support used in the EU. An overview and discussion of those combinations in the EU Member States are provided in Section 3. Section 4 concludes.

2. Primary vs. secondary instruments

RES-E deployment promotion has traditionally been based on three main (primary) mechanisms, whose costs are usually borne by consumers: feed-in laws, quotas with TGCs and tendering (see [3,7,21] for further details). The classical distinction between primary and secondary instruments is a widespread one in the RES-E support literature, although with different names, "dominating instruments" in [22], "main support schemes" in [23–25] and "primary" and "secondary" instruments in [7,21,26,27]. This distinction is made in order to differentiate instruments which are the basis (the main economic incentive) for RES-E support in some countries. Most RES-E investments in EU countries have been triggered by feed-in laws or quotas with TGCs, whereas other instruments have played a minor role, with some exceptions.[1]

- *Feed-in laws* provide for preferential prices per kWh (or MWh) of RES-E generated, paid in the form of guaranteed premium prices and combined with a purchase obligation by the utilities. Feed-in tariffs (FITs) provide total payments per kWh of electricity of renewable origin, whereas a payment per kWh on top of the electricity wholesale-market price is granted under feed-in premiums (FIPs) [28]. Feed-in laws are applied in 23 EU countries.
- *TGCs* are certificates that can be sold in the market, allowing RES-E generators to obtain revenue. This is additional to the revenue from their sales of electricity fed into the grid. Therefore, RES-E generators benefit from two streams of revenue from two different markets: the market price of electricity plus the market price of TGCs multiplied by the number of MWh of renewable electricity fed into the grid. The issuing (supply) of TGCs takes place for every MWh of RES-E, while demand generally originates from an obligation. Electricity distribution companies must surrender a number of TGCs as a share of their annual sales or pay a penalty. The TGC price covers the gap between the marginal cost of renewable electricity generation at the quota level and the price of electricity. Quotas with TGCs are used in 6 EU countries (U.K., Sweden, Belgium, Italy, Romania and Poland), with two of them partially using FITs (Italy and U.K.)
- *Tendering*. The government invites RES-E generators to compete for either a certain financial budget or a certain RES-E generation capacity. Defined technologically neutral or within a given technology band, the cheapest bids per kWh are awarded contracts and receive the subsidy. The operator pays the bid price per kWh. In the EU, tendering is currently used in 9 countries (Bulgaria, Hungary, Malta, Lithuania, Latvia, Italy, Portugal, France and Denmark).
- *Net metering* refers to a regulated arrangement in which utility customers who have installed their own generation systems pay only for the net electricity delivered from the utility (total consumption minus on-site self-generation) [29]. Net metering is currently used in 3 EU countries (Denmark, Italy and the Netherlands), generally as a primary instrument.

Several secondary instruments have been combined with the former in the past, including

- *Investment subsidies.* They are granted in the beginning of the project lifetime and can be calculated as a percentage of the renewable energy output or the specific investment cost, although this latter version is more common. Investments grants for RES-E are available in many EU Member States (MS).
- *Soft loans* are usually provided by governments with a rate below the market interest rate. In some cases, they can significantly reduce the costs of capital. Soft loans may also

[1] This description of instruments is based on [1,18,21].

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