1. Introduction

Without public intervention, the development of technologies for renewable energy generation would be poor. This has two main reasons: the higher external costs (creating damage through pollution) of fossil fuels are not internalised in the energy price, and renewable energy sources (RES) lack competitiveness as a result of higher relative upfront investment costs and greater risks, compared to fossil energy. For these reasons, public authorities intervene by implementing RES support schemes within national, regional and local policy frameworks.[1] Within EU Member States (MS), such support schemes vary significantly in types and implementation, leading to a broad RES support policy mix (read more: Renewable Energy Support Policies in Europe). In order to bring forth the desired outcome, not only regarding the achievement of the target (effectiveness) but also regarding the achievement of the target at lowest costs possible (cost-effectiveness), support schemes need to be designed well.

Based on data available for 2013, most MS seem to be on track to reach their 2020 renewable target, based on the achievement of the interim target.[2] Thus the majority of implemented RES support schemes in MS can be marked as effective, although the degree of effectiveness is fluctuating. However, the extent to which RES targets are achieved at the lowest cost possible (cost-effectiveness) varies greatly, as support policy instruments that are effective in achieving the set target are not necessarily cost-effective.

In this Knowledge Package, first the term cost-effectiveness in the context of RES support is defined in more detail. This is followed by a comparison of the cost-effectiveness of different support policy instruments implemented in EU MS, and finally it concludes with a summary of policy instrument design features recommended in 2014 by the European Commission to be used to increase the cost-effectiveness of the support mechanisms.

2. Background on cost-effectiveness

2.1 Terminology

Cost-effectiveness of RES support refers to the achievement of set RES policy targets at the lowest costs possible. This is however giving leeway for interpretation: cost-effectiveness referring either to the minimisation of renewable energy generation costs or to the minimisation of support costs.[3] In this knowledge package, cost-effectiveness of RES support is understood as minimising the 'costs of support'.

2.2 Different financing mechanisms

There are various options for covering the costs of support. These costs may be e.g. covered by the public budget and thus financed by tax payers, may be included in the transport tariffs or connection costs of the network operator, or covered by levies added to the regular price of electricity or natural gas and thus financed by the consumers. In the majority of EU MS, the costs of RES support are imposed on energy (electricity and/or natural gas) consumers. Only in Luxembourg and partly also in Belgium the support costs are still covered directly by the public budget.[4]

Depending on the financing mechanism used, cost-effectiveness refers then either to minimising the costs for tax payers (public budget) or to minimising the costs for energy end users (adding a levy linked to the consumption level to the top of the energy price) – always relative to the renewable energy actually deployed.

2.3 Determination of cost-effective support levels

Determining the minimal price of support being still effective demands an excellent understanding of different factors such as e.g. generation costs. The determination can be carried out either

- 'price-based' in terms of support levels (the price is fixed by the government thus leading to the respective volume depending on the corresponding cost-potential curve), or
- 'volume-based' due to the determination of a quantity target (the volume is predetermined thus leading to price development depending on existing resource conditions and technology costs).

In addition to these two approaches a frequent determination is that of ‘cost-based’, considering technology specific generation costs included in the calculation of levelised costs of energy (LCOE). This approach is applied by the majority of EU MS, thus determining – mostly administratively – adequate RES support levels. This is for example undertaken in Germany, where support levels for different types of renewable energy are based on their LCOE. The calculation is thereby displayed in so called ‘evaluation reports’ which are released approximately every four years.4

Besides the administrative determination, support levels in various other EU MS are determined via auctions/tenders thus setting a maximum support level for RES technologies. This is for example used in the Netherlands, where ceiling prices are determined and reviewed at the beginning of each year. Based on information available in 2014, this second, more market-based approach emerges more and more, as this system is not easy to manipulate due to e.g. lobbying or other influencing factors.

Besides this ‘cost-based’ approach, another possibility of determining cost-effective support levels considers the estimated amount of avoided external costs of CO2 emissions, health damage, or fossil fuel imports, etc. that are due to the use of RES. However, this approach is used not as often as the ‘cost-based’ determination of cost-effective support levels.4

2.4 Cost-effectiveness varies with circumstances

Adequate determination of support-levels leading to cost-effective RES support mechanisms does not only require an excellent understanding of factors such as generation costs but also an excellent understanding of framework conditions that are subject to change, such as technology cost, fossil fuel prices, raw materials prices, etc. The support mechanisms need to be flexible in order to be able to react and adapt according to these developments. Otherwise, RES support costs might significantly increase (compared to cost-effective approaches). For example, if technology costs decrease, this may lead to a strong growth of this technology’s development, which means that the costs for its support may increase (and could be higher than what would be strictly necessary).4 If on the other hand electricity prices are increasing, support costs in the case of rigid support mechanisms may increase as well, triggered by overconsumption of the available support scheme.1

Flexibility of support mechanisms can be ensured for example by the introduction of policy cost control through the determination of caps (= maximum amounts). Such caps, just like support levels, may be set either ‘volume (capacity, power, generation)-based’ or ‘price-based’. ‘Volume-based’ caps are e.g. realised via quota obligations or auction and tendering systems, thus implicitly setting a cap on policy costs due to defined maximum volumes of RES being supported, or a minimum volume of RES needing to be included in the generation mix. In EU MS where the second mechanism is implemented, this is always done in combination with the introduction of penalty payments if the target will not be achieved, thus limiting the risk of high certificate prices. ‘Price-based’ caps on the other hand are integrated in feed-in systems, due to the degression of support levels after a certain time horizon or the achievement of a pre-defined volume cap. Degression may thereby be carried out on fixed rates or dynamically based on recent cost development.4

3. Cost-effectiveness of different EU renewable energy support mechanisms

Based on this understanding, the cost-effectiveness of the most commonly implemented RES support schemes in the EU varies significantly

3.1 Cost-effectiveness of feed-in tariffs

The support scheme of feed-in tariffs (FITs), bears a high risk of an increase in support costs. If FITs are available without a quantitative target for a specific technology, the expansion of new installations maybe higher than expected , thus strongly increasing the costs of support and simultaneously decreasing cost-effectiveness. Thus, cost and volume control mechanisms are important to maintain the required cost-effectiveness of FITs and in addition give investors more certainty.4

3.2 Cost-effectiveness of feed-in premiums

Feed-in premiums (FIPs), in comparison to FITs, provide partial support by offering a premium on top of the market price, in order to fill the gap between revenues and costs. As a result, electricity producers are participating in the market, thus better regulating demand and supply and preventing possible overcompensation. However, the degree of cost-effectiveness thereby depends on whether fixed or floating premiums are granted. Whereas floating premiums (whereby the amount of support depends on the particular market price) more or less eliminate the risk of overcompensation, fixed premiums don't. However, fixed premiums usually ensure better cost predictability, whereas floating premiums make it difficult to forecast total support costs as long as no cap of maximum support is introduced. By introducing a cap of maximum support on floating premiums cost predictability is increased.4

3.3 Cost-effectiveness of auction schemes and quota obligations

Auction schemes, implemented as an addition to FITs or FIPs, could increase cost-effectiveness significantly. Also quota obligations, show in comparison to feed-in systems, a generally high cost-effectiveness, as – if technology-neutral – only the most competitive technologies are supported. A disadvantage of quota obligations is however that they provide inadequate support to cost-intensive technologies. In that case, technology-banding systems (a different number of certificates is assigned to the technologies, e.g. offshore wind receives more certificates for the same unit of electricity as onshore wind does) are required, which are however not as cost-effective as technology-neutral systems.4

4. Lessons to learn and future recommendations

Cost-effectiveness of renewable energy support depends on both – the type of RES goal and the choice of instruments, as well as the right policy design parameters and potentially a mix of policy instruments. The European Commission in October 2014 argued that more market exposure for renewable energy producers is needed in order to keep support costs under control as some renewable energy technologies have reached a stage of maturity that calls for their integration in the market.5 In addition, the involvement of all participating actors is needed in decision processes regarding modifications of support schemes. For example, if all involved stakeholders under a support scheme agree to maintain support levels but introduce a new levy and eliminate overcompensation in this way, the cost-effectiveness of RES support can be ensured without difficulties. Other important design features for cost-effectiveness are long-term legal commitments, flexible support schemes, transparency, planned review periods and implementation of cost control mechanisms as well as the accomplishment of cooperation mechanisms and harmonisation (read more: Harmonisation of Renewable Energy Policies and Cooperation Mechanisms).1

Sources

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