Dialogue on a RES policy framework for 2030

towards2030

O3.4 Report

Policy pathways towards convergence of renewable energy policies in the EU

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About the project

The aim of **towards2030-*dialogue*** is to facilitate and guide the RES policy dialogue for the period towards 2030. This strategic initiative aims for an intense stakeholder dialogue that establishes a European vision of a joint future RES policy framework.

The dialogue process will be coupled with in-depth and continuous analysis of relevant topics that include RES in all energy sectors but with more detailed analyses for renewable electricity. The work will be based on results from the IEE project beyond 2020 (www.res-policy-beyond2020.eu), where policy pathways with different degrees of harmonisation have been analysed for the post 2020 period. **towards2030-*dialogue*** will directly build on these outcomes: complement, adapt and extend the assessment to the evolving policy process in Europe. The added value of **towards2030-*dialogue*** includes the analysis of alternative policy pathways for 2030, such as the (partial) opening of national support schemes, the clustering of regional support schemes as well as options to coordinate and align national schemes. Additionally, this project offers also an impact assessment of different target setting options for 2030, discussing advanced concepts for related effort sharing.

Who we are?

- Vienna University of Technology, Energy Economics Group (EEG), Austria *(Project coordinator)*
- Fraunhofer Institute for Systems- and Innovations Research (Fraunhofer ISI), Germany
- Energy Research Centre of the Netherlands (ECN), Netherlands
- Center for European Policy Studies (CEPS), Belgium
- National Technical University of Athens (NTUA), Greece
- Consejo Superior de Investigaciones Cientificas (CSIC), Spain
- Ecofys Netherlands and affiliates (Ecofys), Netherlands
- REKK Energiapiaci Tanacsado Ltd (REKK ET), Hungary
- European University Institute, Florence School of Regulation (EUI), Italy

This report…

aims at feeding into the debate on the post-2020 renewable energy legislative framework by identifying possible pathways towards convergence among Member States' renewable energy policies by 2030, and qualitatively assessing them.

For that purpose, it builds on the previous analysis of policy pathways identified in the "Beyond2020" project. This report systemises, adapts and extends those previously identified pathways to the evolving policy and political process in Europe, focusing on those that have been, or are currently part of the recent policy debate.

We identified and analysed five possible pathways for convergence of national RES policies. Three of these are "top-down" processes driven by EU institutions. Additionally, we describe two possible bottom-up convergence pathways driven by voluntary Member State collaboration. Finally, we discuss a 'reference' convergence pathway in which there is no dedicated RES support.

In principle, the 2030 EU RES target could be achieved following any of the five RES policy convergence pathways - or combinations of them - identified and assessed in this report; however, the future RES policy landscape, as well as the geographical distribution, technology mix and (distribution of) total costs of RES deployment could vary substantially depending on the pathway followed.

Bottom-up initiatives alone are unlikely to result in full RES policy convergence at EU level. Top-down intervention will most likely be required to move the process forward. The potential policy effectiveness, efficiency, as well as the depth and scope of convergence achieved by means of these top-down interventions will vary depending on the specific pathway followed.

In practice, the future of RES policy in the EU will probably be a combination of (some of) the pathways described in this report. Several options are conceivable, and the upcoming debate following the publication of the 'winter package' will be key in determining how that future looks like.

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1 Introduction

1.1 The aim of policy convergence

The internal market is a fundamental element of the 'acquis communautaire'. It is one of the EU missions to work towards the completion of the EU internal market. On the other hand, the Lisbon treaty grants Member States the right to decide on their energy mix. Energy policies, including support schemes for renewables, are largely defined on national level. The drive towards the internal market has been reflected in the European Commission's attempts to increase policy convergence of national RES support schemes, arguing that the creation of the internal market can save costs in the renewable energy field via:

- An optimized allocation of resources (with e.g. electricity being produced at the most optimal places with highest solar irradiation or wind speeds);
- More competition and innovation;
- A larger market with harmonised regulation, reduced transaction costs for investors and economies of scale.

However, the approach of harmonising RES support policies has also been criticised by several stakeholders for failing to take into account each Member State specific national situations: the geographical, legal, political, and market conditions in which RES support schemes operate. Arguments that have been evoked against the harmonisation of support schemes include (see Gephart et al. 2012):

- A lack of context-specificity in RES support could decrease the effectiveness and efficiency of support.
- Not all Member States share a comparable ambition towards renewable energy, or common positions towards the EU as a political actor, and hence are willing to transfer the required competences to the EU.
- Uniform support payments across the EU can lead to higher rents for producers using least-cost technologies and sites, hereby increasing target achievement costs.

Until 2009, the debate on policy convergence focused mainly on harmonisation of national RES support schemes, defined as a top-down implementation of common, binding provisions on RES support in the EU. After the Comission's harmonisation proposal was rejected in the adoption process of the 2009/28/EC Renewables Directives, the focus shifted towards the coordination of national support schemes, defined as a bottom-up process by which national renewable energy policies become increasingly similar across Member States. Both harmonisation and policy coordination fulfil the objective of policy convergence, albeit at different paces (Gephart et al. 2012).

With the adoption in April 2014 of the Energy and Environment State Aid Guidelines (2014-2020)[1], the debate on policy convergence has taken a new turn: The European Commission defined competitive bidding (auctions) and direct marketing (market premiums) as the default principles for production support in the EU. These principles have a harmonising effect on national support schemes, as they strongly reduce the support scheme design options left to Member States (auctions combined with premiums, green certificates, investment support), with some exceptions, e.g. for small installations.

In the "winter package" 2016, the European Commission plans to present a new draft post-2020 legislative framework on RES. With the definition of a 2030 legislative framework for RES, the debate on future pathways

[1] The European Commission uses the Guidelines on State aid for Environmental protection and Energy to assess the compatibility of national support mechanisms with internal market rules.

for policy convergence of RES support schemes gains in significance: How could national RES policies converge in this new post-2020 framework?

1.2 The aim of this report: identifying and assessing RES policy convergence pathways

This report aims at feeding into the debate on the post-2020 renewable energy legislative framework by identifying possible pathways towards convergence among Member States' renewable energy policies by 2030, and qualitatively assessing them. For that purpose, it builds on the analysis of policy pathways identified in the "Beyond2020" project: Under the framework of the IEE project *Beyond2020,* several policy pathways with different degrees of harmonisation of RES support were analysed from a legal, economic, technical and political viewpoint (Resch et al. 2013). This report systemises, adapts and extends these policy pathways to the evolving policy and political process in Europe, focusing on those convergence pathways that have been, or are currently part of the recent policy debate.

We first discuss which elements of RES policy can converge and derive pathways for RES-E policy convergence. We then outline the set of assessment criteria against which we compare the pathways. In a next step, we characterise the pathways in more detail and provide a qualitative assessment. Based on this report, a quantitative analysis of RES policy convergence pathways will be performed by TU Wien within the Towards2030 project (report forthcoming).

2 Scoping and definition of convergence pathways

2.1 Which elements of RES policy can converge?

Convergence of EU (RES) policy could include different sectors, policy areas and policy design elements, at diverse governance levels. In terms of the actual elements of RES policy that can converge, the type of support scheme itself is a key one. Diverse types of support schemes have been applied in the EU, including feed-in tariffs, floating or fixed feed-in premiums (direct marketing) - using administratively defined tariffs or auctions to determine a premium, quota schemes, investment subsidies, fiscal incentives, etc.

Similarly, specific design elements of the support scheme - such as the covered technologies and the support period - are different across EU Member States and could be aligned. Beyond the support scheme itself, infrastructure-related policies and regulations are also relevant for RES deployment and can diverge or converge, for instance with regards to grid planning and access procedures. The same is true for administrative procedures, e.g. in terms of permitting and licensing procedures for RES installations and RES producers, and different elements of the power market design, such as dispatching and curtailment rules and balancing rules. More examples of elements to converge or diverge are listed below.

Table 1 Which elements of RES policy can converge?

Elements of convergence	Examples
RES policy support instrument	• Feed-in tariff, premium, quota, investment subsidies, etc. • Competitive processes vs. administratively set levels of support
RES policy support design elements	• Deployment targets (volume) • Scope of policy support (technologies covered, power thresholds to receive support) • Support level and methodologies to establish levels of support per technology • Support period
Infrastructure-related policies and regulations	• Rules to manage interconnections • Transmission and distribution network rules (grid priority / no priority) • Planning procedures, grid access procedures • Infrastructure development policies • Network tariffs
Administrative procedures	• Permitting and licensing procedures
Power market design	• Dispatching and curtailment rules • Intra-day markets • Balancing rules • Capacity markets vs energy-only markets • Right to generate, self-consume and store renewable electricity

In this report we focus on the assessment of EU convergence of RES policy support instruments and their design[2].

[2] EU RES integration in relation with electricity market design is addressed in work package 5 of the project: www.towards2030.eu.

2.2 Sectoral scoping: focus on renewables electricity

In terms of the sectors considered, convergence of EU RES support policies is conceivable in any of the three final energy consuming sectors, namely: power, transport and heating & cooling (H&C). However, the power, transport and H&C sectors are different in terms of the current level of policy convergence as well as in terms of the potential benefits of achieving a higher degree of convergence.

The political debate about the possibility of an EU-wide RES support scheme has been historically focused on the power sector (see Gephart et al. 2012 for a recap of the debate) and justified to a great extent by the large potential benefits of better (geographical) RES resource allocation. Accordingly, this report focuses on renewable electricity policy to illustrate and discuss different pathways towards convergence of EU RES policy. Below we briefly discuss the status and potential of convergence in renewables transport and heating and cooling.

In the transport sector, RES support policy in the EU is currently dominated by national biofuel mandates. These are driven by a mandatory 10% RES target at Member State level by 2020 - which is specific for the transport sector – and was established in the current RES Directive. The current levels of those national mandates and their specific design elements vary widely across EU Member States. It is unclear whether a specific target for the RES-T sector could be part of the new EU regulatory framework for the period 2020-2030; however, a EU-wide RES-T support scheme in the period towards 2030 could reduce cost for producers – compared to the current situation of national policies - by improving investor security through an increased guaranteed market size. On the other hand, the potential efficiencies that an EU-wide scheme could bring in terms of improved geographical resource allocation are less clear, since feedstocks for first generation biofuels are internationally traded commodities, and the cost structure for second generation biofuels is highly capital intensive, rather than resource-intensive.

In the H&C sector, RES support policies are very heterogeneous, location-specific and highly interrelated with energy efficiency measures in the built environment. RES support for H&C differs widely across EU Member States both in terms of (technology) scope and specific policy instruments used. These include fiscal incentives, investment subsidies, feed-in support and RES heat obligations, among other. Depending on the choice of instrument, an EU-wide RES H&C umbrella policy e.g. a RES heat share obligation could contribute to speed up RES deployment in the sector while keeping sufficient flexibility for Member States to decide on specific design elements. However, as heat is mostly local by nature, an EU-wide support for RES-H&C would not necessarily result in improved RES resource allocation efficiency compared to a scenario of national policies.

2.3 Definition and rationale of convergence pathways

The convergence of heterogeneous national RES policies can happen as a result of directives or regulations passed by EU institutions which are then (gradually) implemented at Member State level. We refer to these type of convergence processes as “top-down” pathways (despite being aware that the EU can only legislate with the consent of Member States).

On the other hand, gradual convergence of national RES policies may also happen as some Member States voluntarily intensify mutual learning on RES policy design, collaborate to adopt common design features based on best practices, or merge their national RES support schemes with other EU countries to form joint or regional support schemes. We refer to these types of processes as “bottom-up” convergence pathways.

In this study we analyse five possible pathways for convergence of national RES-E policies. Three of these are “top-down” processes driven by EU institutions. Additionally, we describe two possible bottom-up convergence pathways driven by voluntary Member State collaboration. Finally, we discuss a ‘reference’ convergence pathway in which there is no dedicated RES support. In this case, the EU would rely on the ETS carbon price as the only incentive to achieve the 2030 RES target.

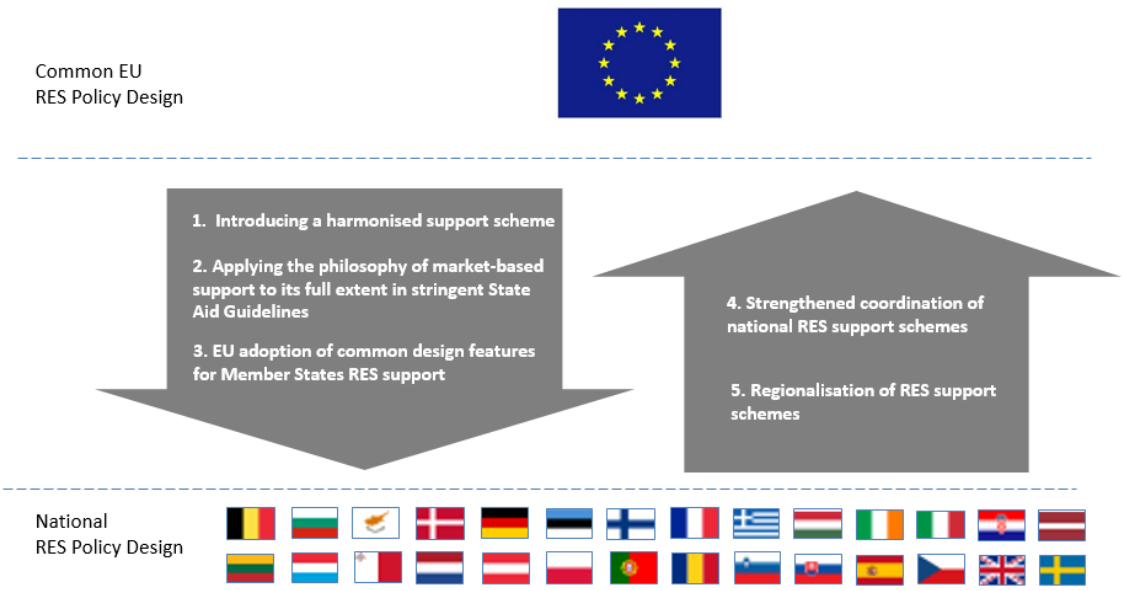

Figure 1 Top-down and bottom-up RES policy convergence pathways

The inventory of pathways presented in Figure 1 primarily aims to cover the range of mechanisms of convergence available. Each of these may materialise in practice with different scopes - e.g. technologies or sectors affected - and with different degrees of convergence - from general guidance on support design to highly prescriptive and detailed regulations. When elaborating on each of these pathways we try to use examples that have been, or are currently part of the EU debate on RES policy.

A similar outcome - in terms of the degree of convergence of national RES support policies by 2030 - may be achieved both as a result of top-down and bottom-up convergence processes. For instance, it is possible to conceive a 2030 situation in which most or all EU Member States share a common design for their support schemes. This could happen as a result of Member States gradually and voluntarily adopting best practices from other EU countries or by means of e.g. EU competition rules establishing a particular policy instrument design as the only acceptable one beyond 2020. However, bottom-up convergence processes are usually much slower than top-down processes and not necessarily complete (Gephart et al. 2012).

Bottom-up and top-down convergence processes are not necessarily mutually exclusive. In fact, both have evolved in parallel in recent years. For instance, the adoption of Energy and Environment State Aid Guidelines is an example of a process driven by the EU Commission, triggering harmonisation of national RES support schemes by restricting the choices of Member States in terms of support instrument applied. On the other hand, we have also seen examples in recent years of bottom-up convergence of RES policies without the intervention of EU institutions. Some common RES policy design features e.g. the transition from fixed tariffs to premiums were first implemented by a handful of countries and later reproduced by several other EU Member States.

Most of the pathways listed above are compatible with each other and can happen in parallel. For instance, increased bottom-up coordination of national support schemes is compatible with certain Member States going a few steps further to agree on a joint regional support scheme. Likewise, these bottom-up convergence processes can in principle run in parallel with EU-driven policies e.g. the adoption of stringent State Aid guidelines for the design of national support schemes or the adoption of a complementary EU funded support scheme to ensure that the overall EU target of 27% renewable energy by 2030 is met in case of insufficient Member State ambition. In contrast, introducing a harmonised EU support scheme (pathway 1) would evidently not be compatible with any of the other pathways, as national support schemes would cease to exist (this would be different, however, if the EU instrument would be applied in parallel to national support schemes, e.g. as a gap-filler). Also

pathway 6 would be incompatible with any other pathway, as any support scheme as such would cease to exist. Pathways 2 and 3 appear to be mutually exclusive but compatible with pathways 4 and 5.

Ultimately, the future of EU RES policy may well be the result of a combination of several of the convergence pathways discussed in this paper. Table 2 below shows a summary of these pathways, which are treated in more detail in the following chapters.

Table 2 Pathways towards convergence of renewable energy policies considered in this report

		How does convergence happen?	Instruments	What converges?			Who drives it?		Who implements it?		Outcomes
				Regulatory framework, e.g. admin & permitting procedures	RES policy support instrument	RES Policy design elements	MS	EU	MS	EU	
Top-down pathways	***1. Introducing a harmonised EU support scheme***	*The EU establishes an EU-wide harmonised support scheme, e.g. a RES quota, to be agreed in co-decision procedure.*	Any instrument. (In this report we assess a RES quota based on technology neutral tradable green certificates)		●	●		●	●	●	EU-wide common support scheme (e.g. a RES quota)
Top-down pathways	***2. Applying the philosophy of market-based support to its full extent in stringent State Aid Guidelines***	*New State Aid Guidelines rules are adopted by the European Commission, after consultation of MS, based on:* *- Opening of support schemes* *- Technology neutrality* *- Competitive determination of support*	Market-based instruments (quota or tenders)		●	●		●	●		Partially opened national technology-neutral and market-based support schemes.
Top-down pathways	***3. EU adoption of common design features for MS RES support***	*The EU defines certain rules that MS adhere to in the design of their support schemes in the new RES Directive. These rules are adopted in co-decision procedure.*	Any instrument	●		●		●	●		EU Member States keep their nationally designed support schemes. The design options are restricted by the EU RES Directive and State Aid Guidelines.
Bottom-up pathways	***4. Strengthened coordination of national support***	*MS increasingly coordinate their RES support schemes, aligning types of support or certain design elements (e.g. adoption of best practices -> progression towards premiums rather than tariffs, frequently updated and decreasing support levels, etc)*	Any instrument	●	●	●	●		●		EU Member States keep their national support schemes, which look increasingly alike due to bilateral /multilateral coordination and adoption of best practices.
Bottom-up pathways	***5. Regionalisation of support schemes (bottom-up)***	*Regardless of EU policy decisions, Member States decide to establish a joint regional support scheme (as Sweden and Norway did)*	Any instrument		●	●	●		●		National support schemes coexist with regional joint support schemes.
	(6) ETS- only	*The ETS is the only instrument to incentivise RES-E. RES support schemes at national level are not allowed.*	N/A					●		●	There is no EU RES support at EU level or at MS level, apart from the Emission Trading Scheme.

3 Assessment criteria

In this report we perform an assessment of the identified convergence pathways on the basis of five key criteria which are generally considered in the evaluation of environmental and energy policies. These build on previous work by Del Rio et al. (2012).

The aim of this report is to perform a qualitative assessment of the policy implications of following each of the pathways. This will be followed by another report including a quantitative analysis of pathways based on a modelling exercise to be carried out by TU Wien also within the framework of the Towards2030 project (report forthcoming).

In order to qualitatively assess the identified pathways, in this report we considered the following evaluation criteria:

Effectiveness in reaching convergence of RES policy and market conditions

One main criterion on which to judge a selected pathway is the extent to which it is effective in driving convergence of RES national policies, defined as the process by which renewable energy policies and related regulations become increasingly similar (or identical) across EU Member States.

Effectiveness in reaching RES deployment targets

A pathway is said to be effective if it can achieve the envisaged RES deployment (or a certain RES target). Reaching the target depends, among other things, on the level of support, as well as on the stability and the degree of security associated with the support scheme, which contributes to keep investor risks at a low level. This qualitative analysis will provide an indication on whether the pathway can trigger new RES deployment. This analysis will be further fine-tuned with the quantitative analysis provided by TU Wien which will estimate whether the pathways can help meet the EU 2030 target.[3]

Cost-effectiveness

Cost-effectiveness (or 'static' economic efficiency) refers to the achievement of a given RES target at the lowest possible cost to society (Del Rio et al., 2012).

In addition to discussing the potential effect of a certain pathway on the economic efficiency of RES policies from a 'static' perspective, we also consider possible 'dynamic efficiency' effects. Certain RES policy pathways could help driving down the costs of less mature technologies, optimising support costs over the long term (e.g. with the horizon in EU 2050 decarbonisation objectives).

Distributional effects

Even if an instrument leads to net benefits for society as a whole, there will be winners and losers. In the context of this project, we will look mainly at distributional effects among Member States: i.e. who pays for and who benefits from a given policy pathway. In particular, we will identify whether a pathway leads to a concentration of the costs of RES promotion in a limited number of countries or within a region. While minimisation of the total costs of complying with RES targets is part of the cost-effectiveness criterion, compliance costs may fall disproportionally upon countries with lower GDP per capita.

Beside this aspect, we also look at whether a pathway can lead to high support payments for low-cost generation technologies, resulting in windfall profits for renewable power plant operators.

[3] It can be expected that the effectiveness criterion becomes specifically relevant for the "ETS only" pathway, that is when no dedicated financial incentives are presumably used for supporting RES deployment. In all other policy pathways (that build on dedicated financial support for RES) the achievement of the 2030 RES target represents a precondition – and differences between pathways can be expected in the corresponding cost of the RES policy intervention.

Political feasibility

In this report, we focus the analysis on political feasibility on whether a pathway seems acceptable to EU Member States governments. Although the European Commission makes legislative proposals, Member States governments in Council have a key role to play in the legislative process. The Lisbon Treaty grants Member States the right to decide on their energy mix.

Another question related to political feasibility is whether the policy pathway will lead to acceptable costs to consumers and taxpayers. In some cases, countries may be willing to make local generation of RES a policy priority, because of its socioeconomic and environmental benefits. This also has implications for the pathway selected, since experience shows that citizens could have low acceptability (and, thus, low willingness to pay) for RES generation when they do not enjoy the local benefits. Thus, citizens may not be persuaded by the increased overall cost-effectiveness of reaching RES targets via international cooperation, because such local benefits would be concentrated abroad. A system is then considered superior in this criterion if it stimulates the local deployment of renewable electricity projects.

4 Assessment of RES-E convergence pathways

4.1 Convergence pathway 1: Introducing a harmonised EU support scheme

4.1.1 Characterisation of the convergence pathway

"Harmonisation" is generally regarded as a top-down implementation of common, binding provisions on the support of RES throughout the EU (Bergmann et al. 2008). As emphasised in the Beyond2020 project[4], harmonisation of national RES support schemes, as a concept, covers many possibilities regarding *what* can be harmonised *and how*, along a continuum from "Full" to "Minimum" harmonisation. *"What" options* concern e.g. targets, support schemes, design elements and support levels. "How" options concern whether, once the system has been implemented, decisions are taken at EU or Member State level.

Full harmonisation can take place on the basis of several support schemes e.g. on tenders, on a quota scheme, on or feed-in premium.

Under this pathway, we have decided to explore the implementation of a quota scheme using technology neutral tradable green certificates (TGC). This would reflect the general market preference of the European Commission, and could be considered the purest form of a market mechanism. Support would be technology-neutral to avoid winner-picking with one TGC being granted per MWh of RES generation, regardless of the technological maturity and costs of the renewable energy generation technology. This would lead to an EU-wide TGC price which would be the same for all technologies and countries.

Box 1 Note on the scope of a harmonised support scheme

A harmonised quota could also be implemented in the 2030 RES governance as a so-called "gap-filler" option, hence meant to fill the gap between Member State pledges and the overall EU binding target. A quota scheme, as a gap-filler option, could also be the first step towards a European support scheme.

4.1.2 Qualitative assessment

Effectiveness in reaching convergence of RES policy and market conditions

This pathway would be highly effective in driving convergence of RES support schemes as it would:

- Establish one support scheme for all Member States
- Imply the absence of primary support schemes existing in parallel as the EU Commission would argue that the quota can only properly function without other schemes being in place. (This would not be true in case of an EU-quota as a gap-filler for the 27% RES target. In this case parallel support schemes would potentially be accepted).
- Establish convergence by legal definition (and be enforced by EU law).

Market conditions would still differ between Member States, as investment risks, cost of capital, electricity market design or cost-sharing approaches for grid connection (among several other elements) might still be different across Member States.

[4] http://www.res-policy-beyond2020.eu/

Effectiveness in triggering RES deployment

The pathway would be effective in triggering RES deployment, but only for low cost renewable energy technologies (unless the target was pushed far beyond 27%, increasing certificate scarcity and price significantly). In principle, an EU-wide TGC price which would be the same for all technologies and countries would support the least-cost options e.g. wind onshore, but it would fail to provide sufficient remuneration for currently less mature technologies - e.g. wind offshore – that are critical to the achievement of EU long term decarbonisation targets.

Cost-effectiveness

In economic theory, quota systems are considered as a least-cost option[5]. Looking at static efficiency and capital expenditures (and not at support costs), quota schemes are theoretically the most efficient option and this EU harmonised support scheme would focus on efficiency and least-cost allocation of resources. However, under circumstances of limited cheap resource potentials it could result in high producer rents for the cheapest renewable energy technologies, since the price would be set by more expensive technologies. In addition, dynamic efficiency would be low because less-mature technologies would not receive support.

Distributional effects

Countries with good RES potentials and low-risk profiles would benefit from such a pathway in terms of increasing the number of RES plants located on their territory. As a result, other Member States would lose RES deployment.

Uniform support payments could lead to higher rents for producers with least-cost technologies and sites in regions of higher renewable resource and with preferable financing conditions. On the contrary, developers in regions with low RES resources / less suitable financing conditions would be more restricted in their investment opportunities and would potentially make lower profits.

Overall, uniform support levels could lead to higher support costs for consumers than technology-specific support.

Political feasibility

On the one hand, harmonisation of EU RES policies has been one of the long-term aspirations of the European Commission. As observed by Guillon (2010), the European Commission has repeatedly mentioned harmonisation as a long-term goal. However, Member States would need to agree unanimously on harmonisation. Member states who do not yet have a quota scheme implemented would presumably oppose a harmonised quota scheme.

In addition, Member States may be reluctant to accept harmonisation leading to an EU-wide TGC price which would be the same for all technologies and countries.

Last but not least, Member States retain the exclusive right to determine their energy mix: Article 194(2) of the Treaty on the Functioning of the European Union states that "*measures shall not affect a Member State's right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply*". Moreover, due to the subsidiarity[6] principle established in the EU, Member States might argue that full harmonisation concentrates competencies at the EU-level to an excessive extent.

[5] Fürsch, M., Golling, C., Nicolosi, M., Wissen, R., Lindenberger, D. (2010): European RES-E Policy Analysis - A model based analysis of RES-E deployment and its impact on the conventional power market. Institute of Energy Economics at the University of Cologne (EWI). Cologne, Germany, 2010, accessible at www.ewi.uni-koeln.de/RESE.297.0.html

[6] The principle of subsidiarity is established in Article 5 of the Treaty on European Union. It aims at determining the level of intervention that is most relevant in the areas of competences shared between the EU and the EU countries. This may concern action at European, national or local levels. In all cases, the EU may only intervene if it is able to act more effectively than EU countries at their respective national or local levels.

Thus, introducing a harmonised EU support scheme does not seem feasible in case it replaces all national support schemes. In case the EU instrument focuses on closing a potential gap between Member States' contributions to the EU target and the 27%, an EU instrument might be acceptable for Member States.

4.2 Convergence pathway 2: Applying the philosophy of market-based support to its full extent in stringent State Aid Guidelines

4.2.1 Characterisation of the convergence pathway

The 2014-2020 Energy and Environment State Aid Guidelines (EEAG) favour market-based principles for RES support. Key provisions are the following:

- RES-plants need to sell their electricity directly to the market ("direct marketing") and be subject to market obligations (apart from "installations with an installed electricity capacity of less than 500 kW or demonstration projects, except for electricity from wind energy where an installed electricity capacity of 3 MW or 3 generation units")
- From January 2017, Member States shall set up competitive auctions (tenders or green certificate auctions) to grant support to new installations (apart from installations with an installed electricity capacity of less than 1 MW, or demonstration projects, except for electricity from wind energy, for installations with an installed electricity capacity of up to 6 MW or 6 generation units). Also Member States can refrain from establishing auction, if they can prove that "only one or a very limited number of projects or sites could be eligible", "a competitive bidding process would lead to higher support levels", or "a competitive bidding process would result in low project realisation rates";
- The opening of national support mechanisms to projects in other Member States is not imposed on Member States, even though it was discussed ahead of the guidelines' adoption. However, DG Competition has forced several Member States undergoing a revision of their national support scheme to implement a partial opening of their support schemes;
- In principle, the EEAG requires technology-neutral support, but leaves several reasons to keep technology-specific support (such as "the longer-term potential of a given new and innovative technology", "the need to achieve diversification", "network constraints and grid stability", "system (integration) costs"). In this case, the burden of proof is not with the Member States, in contrast to exemptions from the requirement to implement auction schemes.

Under this convergence pathway, the new guidelines starting in 2020 would take the existing EEAG as a starting point and fully implement their "market principles". This could mean that the exemptions might be defined in a much more restricted manner and the following provisions would be binding:

- Direct marketing would be required for all except very small installation sizes.
- All RES support would be attributed following a competitive bidding process (or a quota scheme) for almost all installation sizes and without the option to prove that this would not be functional.
- RES support would have to be technology-neutral.
- Support schemes would have to be partially opened (i.e. RES installations from one country being eligible for support from another Member States' support scheme). A full mandatory opening of national support schemes seems unrealistic (politically unacceptable), which is why we decided to assume a partial opening. In any case, this would limit Member States' control over RES deployment on their territory.

In this option, the new State Aid Guidelines would most likely leave Member States the freedom to choose between an auction scheme together with premium payments and a quota scheme. For this qualitative assessment we do not choose any preferred instrument[7].

4.2.2 Qualitative assessment

Effectiveness in reaching convergence of RES policy and market conditions

This pathway would be effective in terms of reaching convergence of RES policy, albeit to a limited extent because still national quotas and auction schemes would be allowed. Apart from this, this pathway would effectively implement market rules, as it would be adopted based on EU law.

Market conditions would converge in terms of exposing RES investors and producers to relatively high risks. However, some RES policy support design elements would not converge, as the support levels and support periods might still be different in different Member States. In addition, further market conditions would still differ between Member States, as investment risks, cost of capital and electricity market design might still be different in the Member States.

Effectiveness in triggering RES deployment

The effectiveness in triggering RES deployment cannot be judged ex-ante, as the effectiveness of auctions and quotas strongly depends on their detailed design.

Cost-effectiveness

As for the harmonised technology-neutral quota scheme, this pathway could be an efficient option as it would result in a focus on least-cost allocation of resources (i.e. to the cheapest technologies and better sites due to the partial opening of the support scheme). However, under circumstances of limited cheap resource potentials it could result in high producer rents for the cheapest renewable energy technologies since the price would be set by more expensive technologies. In addition, dynamic efficiency would be low because less-mature technologies would not receive support.

Distributional effects

On Member State level, the pathway might be acceptable as redistribution of costs and benefits between Member States would happen only to a limited extent (due to the partial opening of support schemes). A cost-benefit analysis and transfer payments could offset this effect, but would be challenging to implement.

Political feasibility

The State Aid Guidelines are adopted by the European Commission. They do not require a co-decision procedure involving the European Parliament and Member States. Hence, the role of Member States in the adoption process would be limited.

This pathway would likely be heavily contested by Member States. Member States more or less accept auctions and direct marketing. Restricting exemptions for small installations or specific circumstances (lack of market liquidity) as well as technology-neutrality is likely to create opposition from Member States. This would result in legal uncertainty.

[7] In the forthcoming quantitative analysis of RES pathways performed by TU WIEN a specific instrument will be modelled.

4.3 Convergence pathway 3: EU adoption of common design features for Member State RES support

4.3.1 Characterisation of the pathway

The EU legislative framework for renewable energy is currently defined by the 2009/28/EC Renewable Energy Directive (RED) and the Energy and Environment State Aid Guidelines (EEAG). Both pieces of legislation already define and fix binding provisions (i.e. common design features) at EU level e.g.:

- Competitive bidding as standard procedure to define support levels (EEAG), as described above;
- "Direct marketing" of RES electricity, i.e. full market responsibility of RES generators (EEAG), also as described above;
- "priority access or guaranteed access to the grid" as well as "priority dispatch" "in so far as the secure operation of the national electricity system permits and based on transparent and non-discriminatory criteria" (RED).

This pathway would start from the already harmonised elements by the RED and the EEAG and add additional elements. It would not mean full harmonisation, but selective harmonisation by the EU of single design elements, thereby strengthening the internal energy market. Certain elements would be prescribed at EU-level, differing from the current provisions agreed within EEAG/RED. Member States would have to implement these commonly defined provisions, selected among the elements displayed in table 2:

Table 3 : Potential common design features (examples additional to already harmonised design features)

Elements of convergence	Examples
RES policy support design elements	• Methodologies to define levels of support (for FIP in case of small installations and for banded quota schemes) or to define ceiling prices, prequalification criteria, penalties (in the case of auctions). • Methodologies to determine average (regional/national) capacity factors (amount of expected full load hours of operation per technology) • Methodology to define levelised costs of electricity (LCoE) per technology (to be regularly updated monitoring the national market) • Methodology to calculate/estimate (future) value of RES electricity, costs for balancing.
Administrative procedures	• Mitigation of non-economic barriers with e.g. common guidelines for grid permit requirements and procedures or maximum / targeted lead times for projects.

This pathway differs from Pathway 2 in that it would not necessarily remove all exemptions for direct marketing, the implementation of the competitive bidding process or technology-neutral support. It would rather identify single elements that might be harmonised across Europe, according to what improves the performance of RES policies in terms of effectiveness and efficiency. In this report, we do not go into detail on these elements (which is beyond the scope of this report), but rather describe and assess this approach in general terms.

4.3.2 Qualitative assessment

Effectiveness in reaching convergence of RES policy and market conditions

This pathway would only lead to partial convergence of RES policies, but it would support the convergence of elements identified as best practice design options. Moreover, it would leave some room for local adaptation of policies and experimenting with policy designs, allowing for policy innovation in the European context.

Further market conditions would not converge as a result of this approach.

Effectiveness in triggering RES deployment

The aim of this pathway would be to improve the effectiveness of existing support schemes, i.e. the harmonised elements would not be defined according to de-contextualized overarching principles, but according to what has proven to work in terms of deploying RES. This could lead to high effectiveness.

Cost-effectiveness

Cost-effectiveness would be one evaluation criterion to assess to decide whether a single element would be prescribed in a harmonised way, i.e. the overall cost-effectiveness of RES policies in this pathway depends on the elements to be harmonised. In any case, the cost-effectiveness of RES policies depends on the implementation by Member States. However, some of the elements (e.g. a common methodology for calculating LCOE and ceiling prices) could improve cost-effectiveness. In addition, this pathway allows technology-specific support, which has positive effects on dynamic efficiency.

Distributional effects

No distributional effects are directly evident in this pathway, as Member States would be in full control of maximum volumes being deployed on their territory.

Political feasibility

This pathway appears politically feasible, because it would leave some room for Member States to define their RES policies. It would harmonise only single elements, seeking to improve the effectiveness and efficiency of RES policies. However, the political feasibility also points to one of the challenges of this pathway, as its success fully depends on the subsequently defined elements to be harmonised. As defined here, it postpones the actual debate between Member States, the Commission and the European Parliament on the extent to which RES policies should be harmonised.

4.4 Convergence pathway 4: Strengthened coordination of national support

4.4.1 Characterisation of the pathway

Strengthened coordination of national policies can be defined as a bottom-up process of Member States voluntarily deciding to work together on RES support elements. Unlike the case of EU adoption of common design features for Member State RES support (pathway 3), in this case Member States voluntary decide to make their support scheme designs converge with those of other Member States.

This pathway would start from the already harmonised elements by the RED and the EEAG and seek further convergence driven by Member States. Converging elements are defined by Member States. Recommendations can be provided by the European Commission, but are non-binding.

National policy planning and growth ambitions can also become increasingly coordinated (e.g. via bilateral or multilateral consultation on national renewable energy plans). Member States would inform each other of planned policy changes to mitigate unintended effects on each other.

The EC could guide this coordination process. For instance, it could calculate average support levels on an annual basis and publish them on the transparency platform, or create a platform of cooperation for large scale projects involving several Member States e.g. on wind off-shore.

4.4.2 Qualitative assessment

Effectiveness in reaching convergence of RES policy and market conditions

This pathway is a rather weak process to converge RES policies and effectiveness would most likely be low. It would in essence continue the status quo and would imply that the current process to increase policy convergence is sufficiently effective.

With this pathway, the transition towards a single energy market may be slower than in any of the preceding pathways, as it would be fully voluntary. Hence, reaching convergence would take much more time or not happen at all.

Effectiveness in triggering RES deployment

This pathway is a gradual process, which provides better investor security compared to a significant overhaul of national support systems and for incremental learning (departing from the changes in national RES policies already triggered by the current EEAG). However, the effectiveness of this pathway in triggering RES deployment would be mixed, depending on the national implementation of support schemes.

Cost-effectiveness

Mixed, depending on the implementation of national support schemes. The cost-effectiveness is likely to increase due to policy learning among Member States, but the extent and timing would be completely unknown. This is true for all changes happening in addition to the current EEAG, which are the starting point for this convergence pathway.

Distributional effects

There is no evident redistribution of costs and benefits between Member States.

Political feasibility

EU Heads of State called, in their Council conclusions of the 23rd of October 2014, to "facilitate coordination of national energy policies and foster regional cooperation". This pathway is on the one hand very feasible, as it

represents more or less the status quo. Voluntary coordination of national RES policies is acceptable to Member States, and hence is more politically feasible than top-down harmonisation, as it complies with the subsidiarity principle.

4.5 Convergence pathway 5: Regionalisation of RES support schemes (bottom-up)

4.5.1 Characterisation of the pathway

This pathway focuses on the clustering of national support schemes into regional support schemes for neighbouring Member States. A joint regional support scheme would be implemented within a regional cluster on a voluntary basis.

We assume a number of criteria for a common region: coupled markets, efficient use of interconnectors, common market rules that facilitate the integration of RES. The regions we will consider - notably in the quantitative analysis - are the following:

- Central Western Europe: Germany, France, Belgium, Netherlands, Luxembourg together with Austria.
- Nordpool: Norway, Sweden, Finland, Denmark together with the Baltic: Estonia, Latvia, Lithuania[8]
- "CZ-SK-HU/PL": Czech Republic, Slovakia, Hungary together with Poland.
- The United Kingdom and Ireland.
- Spain and Portugal.
- Italy, Slovenia and the South-East Corridor (Bulgaria, Greece, Romania, Cyprus, Malta)

4.5.2 Qualitative assessment

Effectiveness in reaching convergence of RES policy and market conditions

This convergence pathway would be effective in reaching convergence of RES policy, however limited to the region covered by the support scheme and not necessarily across Europe.

Nonetheless, regional cooperation helps deepen market integration, boost cross-border trade and facilitates the integration of RES. To make the regionally converged policy pathways compatible with each other, the EC might play a role in coordinating these types of cooperation.

Effectiveness in triggering RES deployment

The effectiveness of the regional support schemes would depend on the choice and design of the support scheme. A regional auction, for instance, would have to be designed to cover the (differing) administrative contexts within a region, while still implementing auction rounds and the same rules for the entire region (e.g. prequalification requirements, time limits for project realisation, etc.)

[8] Two new electricity interconnections connecting Lithuania to Poland and Sweden have been officially inaugurated on 10 February 2016. The LitPol Link connects Alytus in Lithuania with Elk in Poland and the Nordbalt links up Nybro in Sweden and Klaipeda in Lithuania, adding 1200 MW of interconnection capacity to the region.

Cost-effectiveness

If the regional support scheme is designed well (i.e. suitable for this region) cost-effectiveness would increase, as better sites could be used in comparison to national support. If RES deployment is heavily redistributed between Member States, system integration costs can increase, which might decrease the cost-effectiveness of regional support schemes.

Distributional effects

Under this pathway there would be a redistribution of costs and benefits within regions. Member States might want to offset this effect by making compensation payments (based on cost-benefit analysis), but such approach might be difficult to implement.

Political feasibility

The European Commission, the European Council and the European Parliament have all called for regional cooperation, in the context of the 2030 framework on climate and energy. In the Energy Union Package of 25 February 2015[9], the European Commission stated that "enhanced regional cooperation within a common EU framework" is necessary. According to EU Heads of State or Government[10], the future governance system should "foster regional cooperation between Member States". Last but not least, according to the European Parliament, "regional integration has a huge role to play in deploying renewable energy sources cost-effectively"[11]. Thus, several crucial entities seem to approve of this approach. However, if regions were defined in a top-down manner, Member States would likely oppose this definition, if their region does not sufficiently reflect common interests among the Member States. If regions were purely defined in a bottom-up process, it is questionable whether such regions would emerge at all (especially with the aim of creating a joint support scheme). A bottom-up process would also limit the effectiveness in terms of increasing policy convergence.

[9] European Commission 2015, A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, 2015. COM (2015) 80

[10] Council conclusions on 23 October 2014

[11] European Parliament report on "A 2030 framework for climate and energy policies" of 5 February 2014

4.6 Convergence pathway 6: No dedicated RES-E support (ETS-Only)

4.6.1 Characterisation of the pathway

The EU ETS only pathway is a convergence pathway in which dedicated RES-E support is forbidden (e.g. by further restricting state-aid guidelines).

In the EU-ETS-only pathway, the only RES support comes from the pull-effect of the EU ETS: renewable electricity generation technologies are promoted via the impact of carbon prices stemming from the EU ETS (which, depending on the carbon price, could potentially trigger investments into the most mature technologies e.g. wind onshore, but is unlikely to drive deployment of immature technologies). The resulting levels of RES deployment would depend on how the EU ETS develops after 2020.

The review of the EU ETS post-2020 started with the release of a European Commission proposal in July 2015. Some detailed features of the future EU ETS are already known (e.g. an emissions reduction of 43% compared to 1990 levels for covered sectors with a linear reduction factor changed to 2.2% from 2021 onwards). However, the most important and unknown aspect for RES deployment is the resulting carbon price, which has to be sufficiently high to trigger RES deployment.

4.6.2 Qualitative assessment

Effectiveness in reaching convergence of RES policy and market conditions

Using ETS as single instrument for supporting low carbon technologies in the power sector by definition implies some sort of convergence. One might argue that distortions on the power market would be reduced due to the removal of dedicated renewable energy support. However, other distortions would continue such as direct and indirect subsidies for fossil fuels and indirect support for renewables (e.g. fiscal incentives), which would still diverge between Member States.

Effectiveness in triggering RES deployment

Currently most forecasts put the carbon price in 2030 at between 10 and 30 euros, a price below what is currently required to achieve a switch to less mature renewables.

In addition, the energy sector in lower income Member States might not have to pay for allowances, meaning that they could benefit from windfall profits similar to those of the first and second phase of EU ETS, giving little incentive to change generation from fossil fuels to renewables.

Cost-effectiveness

Cost-effectiveness under this policy pathway might be low in the short-term, as there would be no more dedicated support to renewables: first, uniform prices could lead to higher rents for producers with least-cost technologies and sites in regions of higher renewable resource. Second, uncertainty over the evolution of carbon prices would make investments in RES technologies more expensive compared to policy pathways ensuring predictability on the remuneration for RES.

In addition, dynamic efficiency would also be low because less-mature RES technologies would not be incentivised.

Distributional effects

As carbon allowances can be traded across Member States, also RES deployment would be redistributed between Member States towards those with good RES resources and low investment risks.

Political feasibility

A number of stakeholders advocate a phase-out of subsidies for renewables after 2020, and consider a single instrument such as the EU ETS as the best way to achieve GHG emissions reduction in a cost-efficient manner. They argue that it is a "simple" solution that does not require additional sectoral pieces of legislation, except for strengthening the EU ETS.

However, as this approach would leave the envisaged RES deployment fully uncertain and as it would pose fundamental risks to the RES industry, there would be strong opposition by the renewables industry, by most Member States, parts of the European Parliament and of the European Commission.

5 Conclusions

In this report we have identified five pathways for RES policy convergence towards 2030 and assessed them against a set of five key policy evaluation criteria. In addition, a sixth scenario in which the EU would rely exclusively on the EU-ETS to achieve the 2030 EU renewable target was also discussed. A summary of our qualitative assessment of these pathways is shown below in Table 4.

In principle, the 2030 EU RES target could be achieved following any of the five RES policy convergence pathways - or combinations of them - identified and assessed in this report; however, the future RES policy landscape, as well as the geographical distribution, technology mix and (distribution of) total costs of RES deployment could vary substantially depending on the pathway followed.

Table 4: EU RES policy convergence pathways: qualitative assessment summary

		Evaluation criteria				
		Effectiveness in achieving RES policy convergence	**Effectiveness in reaching RES deployment targets**	**Cost-effectiveness** (and dynamic efficiency)	**Distributional effects**	**Political feasibility**
Top-down convergence pathways	***1. Introducing a harmonised EU support scheme*** *(In this report we assess a RES quota based on technology neutral tradable green certificates)*	Highly effective in driving convergence of RES support schemes.	Effective in triggering RES deployment, but only for low cost renewable energy technologies.	Theoretically cost-effective option; however, dynamic efficiency would be low because less-mature technologies would not receive support.	Countries with good RES potentials and low-risk profiles would benefit from this pathway.	Hardly politically feasible in case it replaces all national support schemes.
	2. Applying the philosophy of market-based support to its full extent in stringent State Aid Guidelines *(Including a partial opening of support schemes)*	Effective in terms of reaching convergence of RES policy, albeit to a limited extent because still national quotas and auction schemes would be allowed.	Strongly dependent on the specific design of national auctions or quotas.	Static efficient; however, dynamic efficiency would be low because less-mature technologies would not receive support.	Redistribution of costs and benefits between Member States would happen only to a limited extent (due to the partial opening of support schemes).	Some elements e.g. technology-neutrality are likely to create opposition from Member States.
	3. EU adoption of common design features for MS RES support	It would only lead to partial convergence of RES policies, but it would support the convergence of elements identified as best practice design options.	Strongly dependent on the elements harmonised and implementation at national level. Likely to lead to higher effectiveness as elements harmonised at EU level would be based on proven practices.	Strongly dependent on the elements harmonised and implementation at national level. Likely to lead to higher cost-effectiveness as elements harmonised at EU level would be based on proven practices.	No evident redistribution of costs and benefits between Member States.	This pathway appears politically feasible, because it would leave some room for Member States to define their RES policies.
Bottom-up convergence pathways	***4. Strengthened coordination of national support***	Weak process to converge RES policies. Effectiveness would most likely be low.	Mixed, depending on the national implementation of support schemes.	Mixed, depending on the national implementation of support schemes.	No evident redistribution of costs and benefits between Member States.	This pathway appears politically feasible, as voluntary coordination of national RES policies is acceptable to Member States.
	5. Regionalisation of support schemes (bottom-up)	Effective in reaching convergence of RES policy, however limited to the region covered by the support scheme and not necessarily across Europe.	Effectiveness of the regional support schemes would depend on the choice and design of the support scheme.	Cost-effectiveness likely to increase due to improved RES resource allocation. If RES deployment is heavily redistributed between Member States, system integration costs could increase.	Under this pathway there would be a redistribution of costs and benefits within regions.	If regions were purely defined in a bottom-up process, it is questionable whether such regions would emerge. If regions were defined in a top-down process, Member States could oppose.
	(6) ETS- only	Using ETS as the only instrument for supporting low carbon technologies would result in EU policy 'convergence' by removing existing national RES support schemes.	This pathway would endanger the achievement of the EU RES target for 2030.	Potentially low cost-effectiveness of RES deployment (due to increased capital costs for developers). In addition, dynamic efficiency would be low, as less-mature technologies would not receive support.	As carbon allowances can be traded across Member States, also RES deployment would be redistributed between Member States towards those with good RES resources and low investment risks.	This pathway would be oppossed by the renewables industry, by most Member States, parts of the European Parliament and of the European Commission.

Generally, bottom-up pathways are expected to be less effective in terms of achieving policy convergence at EU level than top-down pathways. While bottom-up cooperation between EU Member States can always be welcomed as a 'non-regrets' option, it is a relatively weak process that cannot guarantee that EU-wide convergence will be achieved at a certain point in time. Similarly, the bottom-up emergence of regional (joint) support

schemes has been a slow and unpredictable process so far. On the other hand, the public acceptance and political feasibility of bottom-up processes tends to be high.

Thus, bottom-up initiatives alone are unlikely to result in full RES policy convergence at EU level. Top-down intervention will most likely be required to move the process forward. The potential policy effectiveness, efficiency, as well as the depth and scope of convergence achieved by means of these top-down interventions can vary depending on the specific pathway considered:

A decision by EU institutions to adopt an EU-wide RES support scheme would directly result in full convergence of RES support; however, the political feasibility of such a system is very low, considering that all EU Member States would need to agree unanimously. Furthermore, it could result in high producer rents for the cheapest renewable technologies and lead to suboptimal long-term results in terms of dynamic efficiency.

Another pathway towards further convergence of EU policies would be the adoption of stringent State-Aid guidelines beyond 2020, applying the philosophy of market-based support to its full extent. This could be done e.g. by limiting current exceptions and prescribing technology-neutral competitive allocation mechanisms. This convergence pathway would build on the existing framework of the current State-Aid guidelines, and its adoption would not require a unanimous decision of all EU Member States; however, it could still be heavily contested. Furthermore, it would lead to suboptimal results in terms of dynamic efficiency, since the less mature technologies would not receive support under a technology-neutral system.

EU institutions could steer the convergence process through ‘softer’ types of intervention by introducing common features for Member States to apply in their national design of support schemes. This would result in 'partial harmonization’ of RES support design, while leaving some degree of freedom to Member States. The effectiveness and efficiency of this pathway - both in terms of policy convergence and RES deployment - depends on the details of its practical implementation; however, this pathway could provide a reasonable trade-off between top-down driven EU convergence and the freedom for Member States to define their own RES policy.

In addition to the five RES policy convergence pathways mentioned above, a sixth scenario in which the EU would rely exclusively on the EU-ETS to achieve the 2030 EU renewable target was discussed. In this ‘reference’ pathway no direct RES support to new generation plants would be allowed. Given the high investment uncertainty and the expected medium term evolution of carbon and power market prices, we conclude that following this pathway would seriously endanger the achievement of the EU RES target for 2030.

In practice, the future of RES policy in the EU will probably follow a combination of (some of) the pathways described in this report. A possible combination could include e.g. pathway 3 (EU adoption of common design features for Member State RES support) operating in parallel with pathway 4 (bottom-up formation of regional support schemes). Furthermore, if the planned Member States contributions to the EU 2030 RES target of at least 27% would be insufficient, the EU could adopt an EU-wide support instrument (pathway 1) as “gap-filler”, operating in parallel with national - or regional - support to bridge the gap at EU level.

Several other combinations of pathways are conceivable. The upcoming debate following the publication of the ‘winter package’ will be key in determining the actual future pathway for RES policy in the European Union.

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