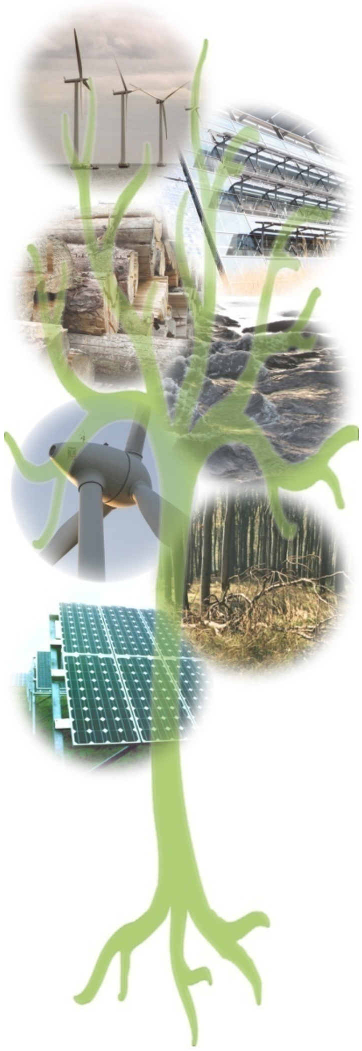
Design and impact of
a harmonised policy for
renewable electricity in Europe

beyond 2020

D7.1 Report

# Inception report beyond*2020*

## - approaches for a harmonisation of RES(-E) support in Europe




Authors:

Gustav Resch, Christian Panzer, André Ortner, Sebastian Busch, TU Vienna / EEG

Pablo del Rio, CSIC

Mario Ragwitz, Simone Steinhilber, Marian Klobasa, Jenny Winkler, Fraunhofer ISI

Malte Gephart, Corinna Klessmann, Isabelle de Lovinfosse, Ecofys

Jana V. Nysten, Dörte Fouquet, BBH

Angus Johnston, UOXF

Carlos Batlle, Pedro Linares, Comillas

Jaroslav Knapek, Tomas Kralik, CVUT

Thomas Faber, EGL Austria

Bugra Borasoy, EnBW

Felipe Toro, Ilja Lifschiz, IREES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## *The* beyond2020 *project*

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| *Web:* | www.res-policy-beyond2020.eu |
| *General contact:* | beyond2020@eeg.tuwien.ac.at |

*Project consortium:*

| | |
|---|---|
| | Vienna University of Technology, Institute of Energy Systems and Electrical Drives, Energy Economics Group (EEG), Austria *(Project coordinator)* |
| | Fraunhofer Institute for Systems and Innovation Research (ISI), Germany |
| | Consejo Superior de Investigagiones Cientificas (CSIC), Spain |
| | University of Oxford, United Kingdom |
| | Becker Büttner Held (BBH), Belgium |
| | Czech Technical University in Prague (CVUT in Prague), Czech Republic |
| | EGL Austria GmbH (EGL), Austria |
| | Ecofys b.v. (Ecofys), The Netherlands |
| | Comillas Universidad Pontificia Madrid (Comillas), Spain |
| | Institute for Resource Efficiency and Energy Strategies (IREES), Germany |
| | Energie Baden-Württemberg AG (EnBW), Germany |

# The beyond*2020* project *at a glance*

With Directive 2009/28/EC, the European Parliament and Council have laid the grounds for the policy framework for renewable energies until 2020. The **aim of this project** is to **look more closely** *beyond 2020* by designing and evaluating feasible pathways of a harmonised European policy framework for supporting an enhanced exploitation of renewable electricity in particular, and RES in general. Strategic objectives are to contribute to the forming of a European vision of a joint future RES policy framework in the mid- to long-term and to provide guidance on improving policy design.

**The work** comprises a detailed elaboration of feasible policy approaches for possible harmonisation of RES support in Europe, involving five different policy paths: i.e. uniform quota, quota with technology banding, fixed feed-in tariff, feed-in premium, or no further dedicated RES support besides the ETS. A thorough impact assessment is undertaken to assess and contrast different instruments as well as corresponding design elements. This involves: a quantitative model-based analysis of future RES deployment and corresponding cost and expenditures based on the Green-X model; and a detailed qualitative analysis, focussing on strategic impacts, as well as political practicability and guidelines for juridical implementation. Aspects of policy design are assessed in a broader context by deriving prerequisites for and trade-offs with the future European electricity market. The overall assessment focuses on the period beyond 2020; however a closer look is also taken at the transition phase before 2020.

**The final outcome** will be a finely-tailored policy package, offering a concise representation of key outcomes, a detailed comparison of the pros and cons of each policy pathway and roadmaps for practical implementation. The project is embedded in an intense and interactive dissemination framework consisting of regional and topical workshops, stakeholder consultation and a final conference.

*Contact details:*

<< Project coordinator and
lead author of this report>>

Gustav Resch

Vienna University of Technology, Institute of
Energy Systems and Electrical Drives,
Energy Economics Group (EEG)
Gusshausstrasse 25/370-3
A-1040 Vienna
Austria
Phone: +43(0)1/58801-370354
Fax: +43(0)1/58801-370397
Email: resch@eeg.tuwien.ac.at

## *This report*

*concludes the inception phase of the beyond2020 project, summarising the work done up to the mid-term of the project and offering a brief outlook on forthcoming working steps.*

*Authors:*
Gustav Resch, Christian Panzer, André Ortner, Sebastian Busch, TU Vienna / EEG
Pablo del Rio, CSIC
Mario Ragwitz, Simone Steinhilber, Marian Klobasa, Jenny Winkler, Fraunhofer ISI
Malte Gephart, Corinna Klessmann, Isabelle de Lovinfosse, Ecofys
Jana V. Nysten, Dörte Fouquet, BBH
Angus Johnston, UOXF
Carlos Batlle, Pedro Linares, Comillas
Jaroslav Knapek, Tomas Kralik, CVUT
Thomas Faber, EGL Austria
Bugra Borasoy, EnBW
Felipe Toro, Ilja Lifschiz, IREES

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| | |
|---|---|
| BAU | business as usual |
| EC | European Commission |
| ETS | emission trading system |
| EU-27 | European Union comprising 27 Member States |
| FIP | feed-in premium |
| FIT | feed-in tariff |
| GC | generation costs |
| GDP | gross domestic product |
| GHG | greenhouse gas |
| MC | marginal cost |
| MS | Member State |
| NIMBY | not in my backyard |
| $p_c$ | electricity price |
| PS | producer surplus |
| PV | photovoltaics |
| $q_{el}$ | quantity of electricity generation |
| S | supply curve |
| $p_F$ | feed-in tariff |
| $p_I$ | investment subsidy |
| $p_Q$ | penalty |
| PT | payback time |
| RES | renewable energy sources |
| RES-E | electricity generation from renewable energy sources |
| RES-H | heat generation from renewable energy sources |
| RES-T | renewable energy sources in the transport sector |
| SNP | strengthened national policies |
| TGC | tradable green certificate |
| TFEU | Treaty on the Functioning of the European Union |
| WACC | weighted average cost of capital |

# 1 Introduction

## 1.1 Overview of the beyond*2020* project

### 1.1.1 Policy context

With Directive 2009/28/EC, the European Parliament and Council have laid the grounds for the policy framework for renewable energies until 2020. The aim of this project is to look more closely beyond 2020, and to do so *well in advance*.

**beyond*2020* tackles problems:**

- Despite the fact that the basis for the policy framework for renewable energies until 2020 has been laid, the debate on (early) harmonisation of RES support has not ended: this creates uncertainty among market actors.
- Proposals for RES-E harmonisation have focused mainly on quota systems / certificate trading.
- Previous evaluations of harmonisation have often been too idealistic / theoretical: specifically, juridical feasibility and political practicability, and risks arising from policy or market failures have been given insufficient consideration, if they have been assessed at all.

**beyond*2020* offers opportunities:**

- The assessment of a broad set of policy options for a harmonisation of RES(-E) support.
- The evaluation of policy proposals from various viewpoints, i.e.: costs & benefits, strategic impacts, political practicability, juridical implementation, market integration aspects.
- The focus is on beyond 2020, but the transitional phase before 2020 is also tackled.
- Contributions will be made to the debate on whether a harmonisation of RES support appears beneficial at all.

*Objectives and targets*

This project aims to look more closely beyond 2020 by designing and evaluating feasible pathways of a harmonised European policy framework for supporting an enhanced exploitation of renewable electricity in particular, and renewable energy sources (RES) in general. With this, the project aims to contribute to the forming of a European vision of a joint future RES policy framework in the mid- to long-term.

The project aims to influence RES policy-making at the EU and national level in the following ways:

- The project will put together and complete the comprehensive analytical knowledge base for designing and evaluating harmonised RES policies. Therefore a limited set of concrete policy paths reflecting the main alternatives for RES support schemes will be designed, evaluated and redesigned in an iterative process.
- This knowledge base will include the evaluation of the designed policy proposals by providing information on the pros and cons of different pathways for a harmonisation of RES support in Europe. Thus, beyond*2020* will obviously contribute to the debate on whether a harmonisation of RES support would be beneficial at all.

- If a harmonised RES support is to be pursued, this project will provide policy-makers with the background information required for a successful practical implementation of policy proposals.
- An intense and interactive dissemination framework across Europe will assure a proper stimulation of the corresponding policy debate at the European and national level. Key stakeholders all over Europe will be invited to reflect upon and reshape key findings gained from beyond*2020*.

Besides policy-making, beyond*2020* also aims to influence investors' confidence concerning the long-term perspectives for RES in general, and renewable electricity in particular, in a positive manner, by establishing the process for the formulation of the post-2020 RES policy framework in good time. With this, the project we will lay the grounds for a smooth transition from national to a harmonised policy framework for RES (assuming harmonisation becomes the preferred policy option).

Fulfilling the envisaged objectives via a successful implementation of beyond*2020* will also facilitate pursuit of the following associated targets:

- to contribute to the achievement of 2020 RES targets by fostering the establishment of a common vision on the future of RES support in Europe in the mid- to long-term (*beyond 2020*). This will definitely increase investor confidence and encourage future investments in RES technologies;
- to assure a continuation of the proper performance of successfully implemented national RES support schemes in the transitional phase, assuming that a harmonisation of RES support would be pursued;
- to decrease the level of support for RES technologies to an adequate level by reducing investor risk, and therefore assure the achievement of 2020 RES targets with efficient and effective support policies in place.

### 1.1.2 The main working steps - from the inception to the consolidation

The work comprises a detailed elaboration of feasible policy approaches for a harmonisation of RES support in Europe, involving different policy paths: i.e. uniform quota, quota with technology banding, fixed feed-in tariff, feed-in premium, no further dedicated RES support besides the ETS, tenders (for large-scale RES), and a reference case (of national RES support with increased collaboration, corresponding to means of a minimum harmonisation). A thorough impact assessment is undertaken to assess and contrast different instruments, as well as corresponding design elements. This involves a quantitative model-based analysis of future RES deployment and corresponding cost and expenditures based on the Green-X model and a detailed qualitative analysis, focussing on strategic impacts as well as political practicability and guidelines for juridical implementation. Aspects of policy design are assessed in a broader context by deriving prerequisites for, and trade-offs with, the future European electricity market. The overall assessment focuses on the period beyond 2020; however, a closer examination of the transition phase before 2020 is also made. The work undertaken is divided into nine work packages, each with a complementary topical focus while generally maintaining a high degree of interlinkage: see Figure 1.

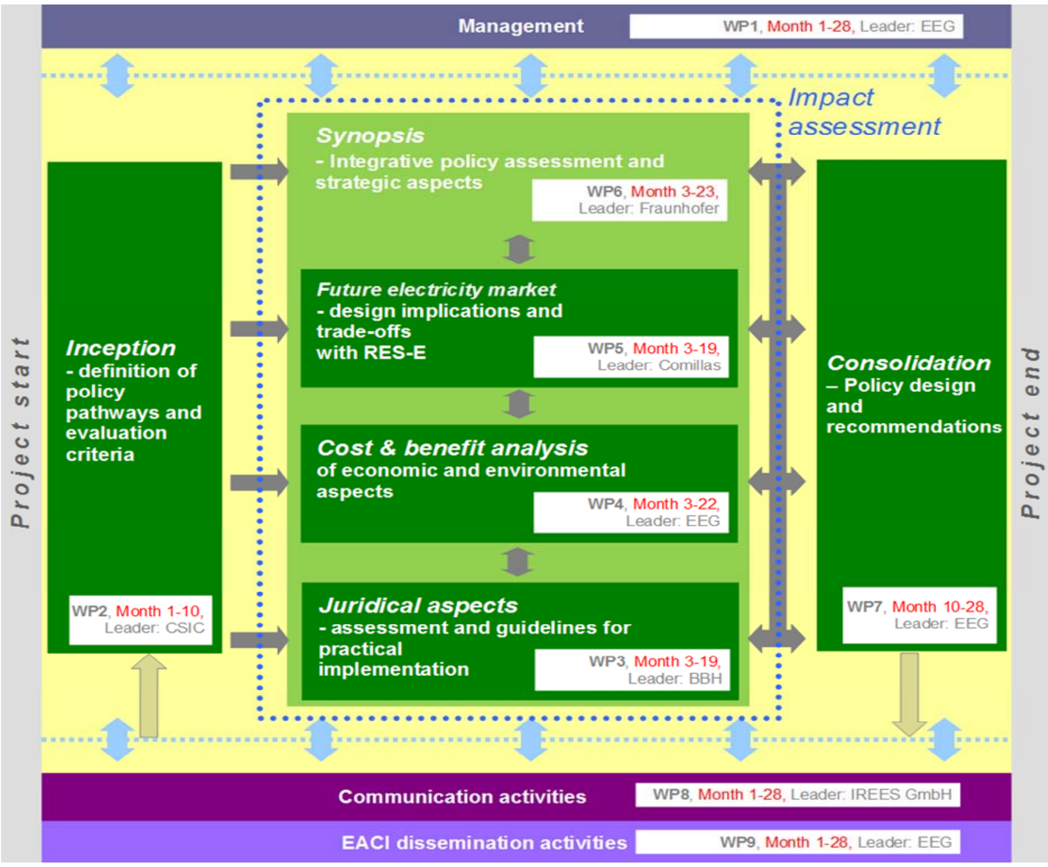


**Figure 1 Flow chart of the beyond*2020* project**

### 1.1.3 Expected results

This project aims to provide the analytical background for the design, evaluation and implementation of policy proposals for a possible harmonisation of RES support in Europe. A broad set of results will be derived within beyond*2020*, available in the form of comprehensive project reports, accomplished by brief summaries of key findings and presentations at workshops as well as via scientific papers.

An indicative list of relevant outcomes of the individual topical assessments undertaken within this project includes:

- Review report on interactions between assessed RES-E support instruments and electricity markets;
- Identification of potential areas of conflict of a harmonised RES support scheme with European Union Law, as well as derivation of legal requirements and recommendations;
- A Multi-Criteria Decision Analysis (MCDA) tool used to evaluate the policy proposals.

The final outcome of this project will be a finely-tailored policy package, offering:

- A concise representation of key outcomes and a detailed comparison of the pros and cons of each policy pathway (including quantitative and qualitative results);
- Detailed roadmaps for practical implementation of each assessed policy pathway;
- Outline of a legal draft for the implementation of key provisions of two recommended policy pathways.

## 1.2 This report

> *This report concludes the inception phase of the beyond2020 project, summarising the work done up to the mid-term of the project and offering an outlook on forthcoming working steps.*

The work conducted in the inception phase is presented in the forthcoming sections 2 and 3. More precisely, section 2 provides the conceptual elaboration of feasible policy approaches for a harmonisation of RES(-E) support in Europe, involving a broad set of different policy paths with distinct options for both the degree of harmonisation and the underlying support instruments. There then follows section 3, which illustrates the final outcomes concerning the definition of evaluation criteria for the subsequent impact assessment from a theoretical viewpoint, discussing and contrasting economic theory and practical applicability. Section 4 is dedicated to presenting an outlook on forthcoming working steps, as well as interim findings made up to the mid-term of the project within the topical work streams. Finally, section 5 concludes this report, summarising key interim findings and offering a brief outlook on the forthcoming tasks within this project.

# 2 Policy pathways for a harmonisation of RES(-E) support in Europe

*The work conducted in work package 2, named "Inception – definition of policy pathways and evaluation criteria", forms the conceptual basis for all subsequent work packages. The main output of the work package is:*

- *the conceptual elaboration of feasible policy approaches for a harmonisation of RES(-E) support in Europe, involving several different policy paths; and*
- *the definition of evaluation criteria for the subsequent impact assessment from a theoretical viewpoint, discussing and contrasting economic theory and practical applicability.*

*This section is dedicated to the first task: the identification of policy pathways.*

*The report D2.1 "Key policy approaches for a harmonisation of RES(-E) support in Europe - Main options and design elements" (Del Rio* et al. *(2012a)), available for download at [www.res-policy-beyond2020.eu](www.res-policy-beyond2020.eu), provides further insights on the topic discussed in this section for the interested reader.*

This section summarises the outcomes of the detailed elaboration of feasible pathways for the harmonisation of RES(-E) support in Europe. In order to define the policy pathways, we have conducted an extensive literature review, including work already performed by the members of the research team, as well as a stakeholder consultation and a consortium-internal cross-check.

The aim of the inception phase is not to propose one precise design for each policy instrument, but to open up the range of feasible design options for the later impact assessment. This will involve both the design of the policy instrument itself and the definition of other important aspects, such as the general electricity market design, the timing of harmonisation (i.e. by 2021 or earlier / later), the technology (i.e. some or all RES-Electricity technologies, or even extended to specific RES-Heat options), the geographical coverage (i.e. EU-27 or also extended to third countries such as the MENA region, Norway and Switzerland), the conditions set by long-term RES targets (at both EU and national level) for 2030 and beyond, etc … .

Pathways are defined at two levels. A first level involves degrees of harmonisation: i.e. at which administrative level the decisions on instruments and design elements are taken, and whether there are national RES-E targets in addition to a European target. On a second level, there are some components of the pathways that need to be harmonised: instruments, design elements, framework conditions and other elements, including the use of cooperation mechanisms and cost-allocation alternatives. The combination of all these components under different degrees of harmonisation results in a broad set of different pathways for analysis and evaluation.

## 2.1 Classification of policy concepts

In the debate on the convergence of support schemes for RES, different concepts such as "convergence", "coordination", "cooperation", and "harmonisation" are used and sometimes conflated. Subsequently we aim to provide further clarification on the terminology, in accordance with Gephart *et al* (2012) classifying and defining the means of the different concepts:

- *"Convergence"* simply means that policies (and possibly related regulations) are becoming similar in different Member States (MSs). Thus, the following concepts can be classified as means to achieve the overarching goal of convergence.

- *"Coordination"* might refer to knowledge exchange between governments and possible alignment of certain elements of a support scheme.
- *"Cooperation"* either refers to governments loosely working together or it might refer to the RES Directive (2009/28/EC) and its inherent possibilities to establish statistical transfer of renewable energy, joint renewable energy projects (among MSs or with third countries) or joint support schemes (that is, merged support schemes) as specified in Articles 6, 7, 9, and 11 of the Directive. All of these concepts have different implications: e.g. regarding who initiates the convergence (top-down or bottom-up), regarding different levels of the binding nature of a given instrument and different levels of detail.
- *"Harmonisation"* is generally regarded as a top-down implementation of common, binding provisions concerning the support of RES-E throughout the EU (Bergmann *et al* 2008). However, harmonisation admits many possibilities concerning what needs to be harmonised and how, along a continuum from "Full" to "Minimum" harmonisation, depending on the combination of "what" options (i.e., targets, support scheme, design elements, support level) and "how" options (i.e., whether decisions are taken at EU or MS level).

## 2.2 Degrees of harmonisation

In order to keep the discussion on the pathways manageable, we consider four alternatives, as illustrated in Table 1. With the aim to be useful for the definition of pathways, we focus on several critical aspects: i.e. whether there are MS targets in addition to the EU-wide target and at what administrative level the decision on instruments and design elements (and, particularly, support level) is taken (EU or MS). A brief description of the different alternatives follows.[1] We have considered four major degrees of harmonisation. Obviously, there might be other possibilities within the wide range of alternatives, but we believe that the ones selected cover the major aspects of harmonisation.[2]

**Table 1 Degrees of harmonisation considered in this report.**

| Degree of harmonisation | MS targets | Support scheme | Decision on design elements | Decision on support level |
|---|---|---|---|---|
| **Full** | No | EU-wide | EU | EU |
| **Medium** | No | EU-wide | EU | EU (plus additional MS support) |
| **Soft** | Yes | Same instrument used in MS, not uniform | MS (some imposed by EU) | MS |
| **Minimum** | Yes | MS decision. | MS (some imposed by EU) | MS |

- *Full harmonisation* involves the setting up of EU-wide targets (no MS targets), an EU-wide support scheme, harmonisation of framework conditions and harmonisation of the design elements of the support scheme selected. There is a very limited role to be played by the MS. Full harmonisation involves harmonisation of the *level* of support, harmonisation of support *schemes* and harmonisation of the *legal framework* as a whole, including regulatory issues. An EU-wide socialisation of the costs of support takes place. The focus on Full harmonisation is justified because this seems to have been a long-term aspiration of the European Commission. As observed by Guillon (2010), the European Commission has repeatedly

[1] For a discussion on different degrees of harmonisation, see Bergmann *et al* (2008) and Guillon (2010).

[2] In particular, an alternative which has not been discussed is the possibility to combine an EU-wide support level (as in Full and Medium harmonisation) with MS targets (as in Soft and Minimum harmonisation).

mentioned that harmonisation remains a long-term goal (European Parliament and Council, 2001 and/or European Commission 2005, 2008). Notwithstanding this, while Full harmonisation remains a long-term aspiration, lower degrees of harmonisation are also possible and it is very difficult at this stage to tell what will be the final degree of harmonisation. Thus, we also consider softer degrees of harmonisation.

- *Medium harmonisation* would be very close to Full harmonisation. There is also one EU-wide instrument and EU support level, but countries may provide additional (albeit limited) support for specific technologies, either within the EU-wide support scheme (i.e., additional remuneration based on local benefits under feed-in tariffs or premia) or as an additional instrument to the EU-wide support scheme (i.e., investment subsidies or soft loans). The latter option would be more feasible in the case of quotas with TGC or tendering schemes, since it would be very difficult or even impossible for MSs to provide additional support directly incorporated into an EU-wide TGC or tendering scheme. Countries may be willing to provide additional support depending upon the local benefits of RES-E. It should be taken into account that having additional support per country would mean that the EU target may be exceeded (since the EU-support level is set to reach those targets). Alternatively, the EU support level may be set taking into account the amount of RES-E that MSs are willing to have and may inform the Commission on the level of support and amount of RES-E that it would like to promote. The level of EU-wide support would thus be set interactively. Another option would be to have (indicative) national targets and use Art. 6 cooperation mechanisms (statistical transfers) to redistribute the additional RES-E capacity across countries. But no MS targets have been assumed in this scenario because an EU-wide support scheme with a single support level would render MS targets meaningless.
- *Soft harmonisation*. This harmonisation alternative would be closer to Minimum harmonisation than to Full harmonisation. There is an EU-wide target, but also national targets consistent with the EU target. Countries have to implement domestically the support scheme that has been decided at EU level. However, countries may use whatever design element they deem best and support levels may differ across countries.[3] There might be some design elements imposed at the EU level.
- At the other end of the spectrum, under *Minimum harmonisation*, EU-wide targets as well as national targets are set by the EU. MSs decide on both the type of support scheme that they apply as well as its design elements. MSs may set whatever support level they deem better. There might be minimum design elements set by the EU (e.g. authorisation procedures and an obligation to support different technologies).

## 2.3 Framework and other conditions of support

In addition to design elements, there are some "framework conditions", unrelated to the instrument chosen, which have a role to play in the harmonisation process. Bergmann *et al* (2008) distinguish between "preconditions" and "framework conditions". The former encompass binding targets, a common liberalised power market, true competition and a level playing field and harmonised planning procedures. Framework conditions are defined as those aspects for RES-E support that are either outside the support system itself or that may be designed similarly irrespective of the type of system applied (Bergmann *et al* (2008), p.133). Preconditions include grid access procedures, permit procedures, the existence of long term, binding targets or investment security; framework con-

[3] There is no possible combination of the medium and soft alternatives, since having national targets is incompatible with support levels being decided at EU level. This is because there is no possibility for countries to do anything extra themselves to reach those targets: i.e., they can not change the support level to reach those targets. National targets only make sense if countries have an instrument in their hands to reach them (i.e., support levels).

ditions include aspects like the kinds of technologies supported, the duration of support, or the differentiation of support according to technology and time of commissioning. Given the pre-eminence given to design elements in this report, however, the latter are addressed in the section on design elements: i.e., they are not considered as "framework conditions". Some framework conditions are unrelated to support schemes (i.e., they are outside the support scheme), whereas others are generically related to support schemes: i.e., common to all support schemes (aspects designed similarly irrespective of the type of system applied).

In addition, there are other aspects which do not fall under framework conditions thus defined: issues of cost-allocation and the use of cooperation mechanisms.

Decisions on framework conditions may be taken at the EU or MS level. The harder the degree of harmonisation, the more likely they will be decided at EU level. We thus consider the following framework and other conditions summarised in Table 2.

**Table 2 Framework and other conditions relevant in the harmonisation process.**

| List of relevant conditions (harmonisation process) |
|---|
| Targets |
| Geographical coverage |
| Sectoral coverage |
| Eligibility of plant in other countries |
| Authorisation procedures |
| Grid access conditions |
| Distributions of grid connection costs |
| Use of secondary instruments |
| Cost allocation (burden sharing) |
| Use of cooperation mechanisms |

- *Targets* are decided at EU level, as in the current Directive. However, there might also be MS targets, according to the principle of subsidiarity. The existence of MS targets opens up different possibilities in the choice of design elements, such as the use of cooperation mechanisms. Regarding the timing of those targets, both 2030 and 2050 are considered. 2030 is regularly used as a target date in many energy model simulations (including the IEA World Energy Outlook: IEA 2010a), while 2050 is explicitly considered in the EU Roadmap and also in some model simulations (IEA Energy Technology Perspectives: IEA 2010b). Under Full and Medium harmonisation, targets are set at EU level and there is only an EU-wide target. Under Soft harmonisation, the EU-wide target coexists with national-level targets set by the EU.
- *Geographical coverage*. Although foreign plants might be eligible (usually with the condition of reciprocity), geographical coverage in this project is also set at EU level. Since this project deals with the "design and impact of a harmonised policy for renewable electricity in Europe", we assume that the current EU-27 is included in the analysis. This affects all degrees of harmonisation. Eligibility of plants in other countries creates complexity for designing and monitoring the system (e.g. production level, electricity price, quality criteria).
- *Cooperation with third countries.* In particular, imports (to the EU) of biofuels and solid biomass as well as renewable electricity (RES-E) will be considered in the overall assessment. More precisely, for Green-X modelling feasible import volumes will be defined. For imports of RES-electricity from North Africa, a simplistic assumption that reflects appropriately the outcomes of relevant studies in this topical area may prove sufficient.

- *Sectoral coverage* is also set at EU level. Similarly to the previous point, since this project is focused on renewable electricity, the RES-heat and RES-transport sectors will not be considered in full detail. The detailed definition of policy options which will be discussed will concentrate on RES-electricity. Note, however, that the overall assessment is not limited to that – RES-heat and RES in transport will also be included in the assessment. Thus, a similar approach to that discussed for RES-electricity will be applied to support of RES-heat, reflecting the gradual shift from a national to a more European approach within the assessed policy options. It remains vague how to deal with the policy framework for biofuels in the transport sector, where a high degree of harmonisation is already applicable today. It may serve well to apply similar assumptions for the future development under all policy options, assuming no explicit sectoral target beyond 2020 but rather a continuation of previous European efforts to achieve the transition to a more sustainable use of energy in the transport sector.

- *Eligibility of plants in other countries* should be decided at EU level, but is only relevant as long as there are national targets and national RES-E support schemes. It is obviously not relevant when an EU-wide support scheme is implemented: i.e., with *Full* and *Medium harmonisation*. The decision is relevant under *Soft harmonisation* or in the case of *Minimum harmonisation*. In these latter two options, countries may allow foreign plants to be treated as eligible for domestic support (if allowed by the EU).

- *Non-economic barriers* include administrative barriers related to the grant of permits and grid-access conditions. A mitigation of these currently unevenly distributed constraints appears crucial to achieving a level playing field for RES in Europe. Thus, the grant of permits and grid-access conditions would be made uniform at the EU level under the *Full* and *Medium* degrees of harmonisation. It would involve the setting of some minimum EU standards in the other two degrees of harmonisation: for example, by setting a maximum time limit within which permits should be granted (all administrative levels). This should provide a homogeneous (and short) lead time for RES-E investors all over Europe. Regarding the second element, priority access to the grid should be enforced at EU level.

- *Distribution of grid connection costs*. A crucial aspect is how the costs of grid connection are distributed. There are basically three alternatives: deep connection charging, shallow connection charging and super-shallow connection charging. Only the latter two are favourable for RES-E plants (Guillon 2010, Klein *et al* 2010) and, thus, either one or the other should be implemented. This should also be harmonised across the EU in all of the possible degrees of harmonisation.

- *Use of secondary instruments by MSs*. Secondary instruments (investment subsidies and fiscal incentives) may be used by MSs to either: (a) provide additional support for specific technologies (additional to the EU or MS support); or (b) support specific technologies which are not supported by the EU or MS scheme. In order to avoid distortions between MSs, the possibility of using secondary instruments should be decided at EU level. Under *Full harmonisation*, neither possibility ((a) or (b)) would be allowed. Under *Medium harmonisation*, MSs could provide additional (albeit limited) support (option (a)) and support for technologies which are not supported by the EU-wide scheme (option (b)) where they are eligible for support (on the basis of an EU decision). Support by secondary instruments is allowed in the case of a *Soft and Minimum harmonisation*.

The decision on the application of a given framework condition (i.e., what administrative level is responsible for the decision) might be different under different degrees of harmonisation, as shown in Table 3.

**Table 3 Framework conditions in dependence of the degree of harmonization**

| Degree of harmonisation | MS targets | Eligibility of plants in other countries | Authorisation procedures | Enforcement of grid priority access | Decision on distribution of grid connection costs | Secondary instruments by MS |
|---|---|---|---|---|---|---|
| **Full** | No | Not applicable | EU | EU level | EU | N |
| **Medium** | No | Not applicable | EU | EU level | EU | Yes (limited) |
| **Soft** | Yes | Possible | MS – with minimum EU standards | MS level – with minimum EU standards | EU or MS | Yes |
| **Minimum** | Yes | Possible | MS – w /o minimum EU standards | MS level – w/o minimum EU standards | EU or MS | Yes |

## 2.4 Design elements and options

### 2.4.1 The instruments

RES-E promotion has traditionally been based on three main (primary) mechanisms: feed-in tariffs (FITs), quotas with tradable green certificates (TGCs) and tendering (see del Río and Gual 2004, Ragwitz *et al* 2007, Schaeffer *et al* 2000, and Huber *et al* 2004 for further details).

- *Feed-in tariffs* offer financial support per kWh generated, paid in the form of guaranteed (premium) prices and combined with a purchase obligation by the utilities. The costs are usually borne by consumers. The most relevant distinction is between fixed feed-in tariff (FITs) and fixed premium (FIP) systems. The former provides total payments per kWh of electricity of renewable origin while the latter provides a payment per kWh on top of the electricity wholesale-market price (Sijm 2002). Each has its pros and cons: In general, while FIPs are usually considered more market-compatible, FITs provide greater certainty for investors.
- *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 kWh of renewable electricity fed into the grid (Schaefer *et al* 2000). 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 consumption. Otherwise, they will have to pay a penalty. The TGC price results from the interaction of supply and demand and depends on the level of the quota (Q) and the marginal costs of RES-E generation ($MC_{RE}$). The expected TGC price ($P_{TGG}$) covers the gap between the marginal cost of renewable electricity generation at the quota level and the price of electricity ($P_e$). $P_e$ and $P_{TGG}$ move in opposite directions: an increase in $P_e$ reduces the TGC price accordingly.
- *Tendering.* The government invites RES-E generators to compete for either a certain financial budget or a certain capacity of RES-E generation. Within each technology band the cheapest bids per kWh are awarded contracts and receive the guaranteed remuneration (Schaeffer *et al.*, 2000). The operator pays the bid price per kWh. A fund financed by a levy on electricity consumers or taxpayers covers the difference between this bid price and the market price of electricity.

### 2.4.2 Common design elements

It is well-known from the literature on RES-E support schemes that the success of RES-E promotion is as much an issue of choosing the appropriate instruments as it is of including suitable design elements. Thus, the focus on design elements is justified.

It is assumed that those design elements which have proven their relevance from a national perspective could also be relevant in a EU harmonisation perspective. The EU focus may reduce or enhance the relevance of some of those design elements.

Some design elements are common to different instruments, although the specific form this may take may differ between instruments. Other design elements are clearly instrument-specific. This subsection discusses the former, whereas the latter are discussed in the next subsection.

- *Eligibility of plants (new vs. existing).* Only *new plants* are eligible. The aim of support schemes is mainly to promote new capacity. The harmonised support scheme should not apply to existing capacity. However, following the principle of non-retroactivity, existing plants would be continue to operate under current (national) RES-E support schemes until these are phased-out (i.e. until the guaranteed period for support ends).
- *Constant or decreasing support level during support period.* Support for existing plants may be greater at the start of the period and be reduced over time (either an annual percentage reduction or a stepped reduction after some years) or support may be constant over time. All in all, the terms and conditions of this reduction should be known beforehand.
- *Eligibility of technologies* (i.e., which technologies are included or excluded) is also an EU prerogative, as it is currently under the RES Directive (Directive 2009/28/EC (European Parliament and Council (2009)), where the eligible technologies are defined. We also assume that these are the technologies included.
- *Cost burden of RES-E support.* The cost burden for RES-E support may fall on either electricity consumers or taxpayers (i.e., the public budget).[4] However, since the costs of the main instrument in the relevant MS fall on consumers, this is also assumed here. Furthermore, it needs to be decided whether an equal or an uneven distribution among consumers is to be used.
- The *duration of support* is a crucial element in all instruments and should be homogeneous at EU level (in order to avoid distortions between MSs). The specialised literature shows that long (but not over-long) duration periods of between 15 and 20 years provide low risks for investors and, thus, comply with the effectiveness and efficiency criteria (low risk premia make projects more bankable and reduce the financial costs of the project). Duration in a TGC scheme refers to the period over which plants may expect to receive certificates. Long-term contracts in TGC schemes are assumed (making this instrument closer to a tender scheme). With FITs, the duration of support refers to the period over which the plants will receive the premium or the tariff.
- *Technology-specific support.* A similar support level might be provided for all technologies (regardless of their generation costs) or support could be modulated according to those costs. The manner in which support is provided to specific technologies is clearly very different under different support schemes. Thus, a more detailed discussion of this design element will be provided under the heading "instrument-specific design elements".
- *Size-specific support level.* Support may be differentiated according to the size of the installation, taking into account that: generally, the generation costs (€/MWh) of larger in-

[4] Eventually, RES-E support could also be financed by all energy consumers, as with the Green cent proposals in Spain.

stallations are lower since they benefit from economies of scale; and governments may want to promote small-scale installations for a number of reasons (decentralised generation and social acceptability).

- *Location-specific support.* Support levels might be modulated according to the location of the plant (e.g. built-in, stand alone), with greater support levels provided for plants deployed in places with greater costs. At first, this may seem at odds with economic efficiency, since installations would not be promoted where generation costs are minimised. However, this is not always the case since, if the good sites are limited, the producer surplus could be excessive. All in all, this disincentive may be eliminated by making the differential support (support levels minus support costs) still greater at places with the best renewable resource. The rationale behind location-specific support is to avoid concentration of renewable energy projects in a few locations.

Some of the aforementioned common design elements may take different forms under different support schemes. Table 4, below, shows these commonalities and differences and provides a brief assessment of each design element.

**Table 4 Common design elements under different support schemes and brief assessment**

| Design element | FIT | FIP | TGC | Tendering | Assessment |
|---|---|---|---|---|---|
| **Eligibility of plants (new vs. existing).** | Only new plants commissioned after a specific date are eligible for support | | | | In most cases only new plants are eligible, with some grandfathering or transitional arrangements for non competitive existing plants |
| **Flow of support (constant or decreasing support level during support period)** | FIT level constant during the duration of the support or "front loading", i.e. reductions of FIT over time | FIP level or sum of FIP + electricity price (in case of sliding premium) constant during the duration of the support or "front loading", i.e. reductions of FIP over time | Constant support over time or more TGC per MWh generated in the first years of operation or for a fixed quantity of generation, and less TGC/MWh thereafter or equal number of TGCs per MWh generated over time. | Constant support over time or preestablished % reduction over time (previous to the bidding procedure) | Given the capital-intensity and high up-front costs of RES-E plants, providing greater support levels at the beginning of their lifetime ("front-loading") helps their financing compared to the same overall amount of support constantly granted over time. In practice, however, this might create a complex system that lacks of transparency and comprehensibility. For supply driven RES-E, increasing weather and revenue risk. |
| **Eligibility of technologies** | Decided at EU level. Current Directive | | | | The Directive includes a sufficiently broad definition of RES eligible for support |
| **Cost burden of RES-E support (taxpayers vs. consumers)** | FIT systems can be funded by public budget or charge on electricity bills | FIP systems can be funded by public budget or charge on electricity bills | Cost of TGC system usually borne by electricity consumers via charge on electricity bill but may also be funded by the public budget. | Public budget or electricity bill | Consumer-financed support is generally considered more stable than budget financed support. |
| **Duration of support** | Period during which support is guaranteed (e.g.15,20,25 years) | | | | The longer the duration, the more certainty to the investors |

**Table 4 (continued) Common design elements under different support schemes and brief assessment**

| Design element | FIT | FIP | TGC | Tendering | Assessment |
|---|---|---|---|---|---|
| **Technology-specific support** | FIT is differentiated across technologies to reflect technology-specific generation costs. The alternative is to have a uniform fixed tariff for all technologies | FIP is differentiated across technologies to reflect technology-specific generation costs. The alternative is to have a uniform premium for all technologies | Banding can be implemented through carve-outs or through credit multipliers. Under carve-outs, targets for different technologies exist, leading to a fragmentation of the TGC market, with one quota for the mature and another for the non-mature technologies. Under credit multipliers, more TGCs are granted per unit of MWh generated for immature technologies compared to mature technologies.<br>The alternative is no use of carve-outs or credit multipliers, such as in the Swedish and Polish TGC schemes. | Banding | Technological neutrality leads to static efficiency, but technology-specific support allows for technology diversity, which could be superior in the long term.<br>In TGCs, carve-outs may lead to narrow markets (i.e., it narrows the tradable volume within each sub-quota) if implemented for one technology in one country, but may be interesting if implemented at EU level. Credit multipliers may lead to the problem of "net neutrality"/TGC vs. electricity accounting. In the 2007 reform of the U.K. RO, the U.K. Department for Business, Enterprise & Regulatory Reform (BERR) decided to implement credit multipliers rather than carve-outs (Bergmann *et al* 2008). |
| **Size-specific support level.** | FIT level modulated according to the plant size. Smaller FIT for large-scale and higher tariffs for small-scale plants.<br>Only installations below a certain capacity threshold would receive the support (stepped FIT) | FIP level modulated according to the plant size. Smaller premiums for large-scale and higher premiums for small-scale plants.<br>Only installations below a certain capacity threshold would receive the support | Small-scale installations receive more TGCs than large-scale installations<br>Only installations below a certain capacity threshold are eligible to receive TGCs | Size-differentiated tendering procedures.<br>Instrument mostly for large scale RES | Stepped tariffs have their pros and cons (see Klein *et al* 2010, Ragwitz *et al* 2007).<br>Size limits have pros (encouraging small generators) and cons (lower economies of scale) |
| **Location-specific support level** | FIT level modulated according to the location of the plant (stepped FIT) | FIP level modulated according to the location of the plant. | Different number of TGC according to the location of the plant. | Pre-approval of sites. Location-specific support is the result of the bidding procedure. | Stepped tariffs have their pros and cons (see Klein *et al* 2010, Ragwitz *et al* 2007). |

Source: Own elaboration based on BMU (2011), Ragwitz *et al* (2007), European Commission (2008), del Río (2008, 2010), Haas *et al* (2004), Mendonca and Jacobs (2009), Kaldellis (2011), Kiviluoma (2010), KEMA (2008), Beaudoin *et al* (2009), Couture *et al* (2010), Yatchew and Baziliauskas (2011), Rickerson *et al* (2007), Rickerson *et al* (2008), Deutsch Bank (2009), Haugwitz (2008), Pegels (2010), NERSA (2009) and Mitchell *et al* (2011).

Note: * Y = yes; N = no. ** Except hydro <10MW. Plant size usually determines support level.

### 2.4.3 Concluding remarks

Not all of these design elements have the same degree of relevance for the purposes of this project. In TGCs, a crucial distinction is to be drawn between uniform quotas and banding (through carve-outs or credit multipliers). In FITs a similar distinction should be made between uniform FITs (technology-neutrality within renewable energy technologies) and technology-specific FITs (allowing for the deployment of different technologies). An even more crucial choice in FITs is between fixed tariffs and premia. Accordingly, these design elements provide the justification for the initial and main distinctions between pathways (see section 2.5, below).

On the other hand, the poor results from the assessment of some design options rules out their use. For instance, this is the case with support linked to the electricity price in FIT schemes or with borrowing in TGC schemes. Therefore, these alternatives should not be considered in the pathways. At the other end of the spectrum, there are some design options which are crucial, such as penalties in quotas with TGC schemes. In the middle, there are also alternatives for which no unambiguous score on its assessment can be given and/or which may be relevant in the national context but not so much in an international one. Simulations with different possibilities may provide insights into their final relevance. In addition, the multi-criteria assessment carried out in work package 6 will investigate whether or not these are so relevant for different stakeholders.

## 2.5 Identified policy pathways

Combining the degrees of harmonisation with the instruments and relevant design elements leads to several policy paths for a harmonisation of RES(-E) support in Europe. Banded and unbanded TGCs, premium and fixed FITs are currently widespread instruments in the EU MSs. Tendering schemes are not widespread, but there is a trend in some countries to use them for large-scale RES projects. Unbanded TGCs were initially adopted in the U.K. and Italy, but concerns about the lack of incentives for the deployment of less mature technologies led to a shift to banded TGCs. Unbanded TGCs are still present in Belgium, Poland, Romania and Sweden. A uniform quota is still proposed by those arguing in favour of inter-technology competition (i.e., competition between different renewable energy technologies to meet the target, even if this means technologies with different maturity levels). However, it is widely acknowledged that this technology neutrality would involve the dominance of mature technologies without allowing immature technologies to penetrate the market. The costs of immature technologies (partly) depend on their diffusion; this would mean that their costs would make them unattractive for adoption, since these technologies will be needed in the future to comply with RES-E (and $CO_2$) targets cost-effectively. Their advancement along their learning curve (through diffusion) is required, which calls for technological diversity and, thus, justifies a banded TGC.

Table 5 summarises the policy pathways considered that will be analysed in a detailed manner within the course of this project. The list of identified pathways has become significantly longer than the limited set of main options analysed during the quantitative interim assessment of the project (see section 4.2). Taking into account the aforementioned policy paths and the design elements, their combination may lead to several alternatives for the design of the pathway. In this section we consider the possible combinations in greater depth. It should be recalled that the aim of this inception phase is not to propose one precise design of each policy instrument, but to open up the range of feasible design options for the later impact assessment.

Accordingly, 15 policy pathways are proposed, taking into account the main RES-E support instruments (TGCs, FITs and tendering), their main design elements and different degrees of harmonisation. Within those policy packages, further choices have to be made regarding some design elements and the role of MSs.

**Table 5 Overview on proposed policy pathways**

| *Degree of harmonisation* | *Characterisation* (*Instrument* →) | **FIT** (feed-in tariff) | **FIP** (feed-in premium) | **QUO** (quota system with uniform TGC) | **QUO banding** (quota system with banded TGC) | **ETS** (no dedicated RES support) | **TEN** (Tendering for large scale RES) |
|---|---|---|---|---|---|---|---|
| **Full** | • EU target<br>• One instrument | 1a | 2a | 3a* | 4a | 5* | 6<br>Sensitivity to 7 (national support, but harmonisation for selected technologies) |
| **Medium** | • EU target<br>• One instrument<br>• Additional (limited) support allowed | 1b | 2b | 3b | 4b | | |
| **Soft** | • EU & National targets<br>• One instrument<br>• MS can decide on various design elements incl. support levels | 1c | 2c | 3c | 4c | | |
| **Minimum** | • With mini-mum design standards for support instruments<br><br>• EU & National targets<br>• Cooperation mechanism (with or w/o increased cooperation) | 7*<br>**Reference** (national RES support with cooperation)<br>*(with or without minimum design standards)* | | | | | |
| **No** | • No minimum design standards for support instruments<br><br>• EU & National targets<br>• Cooperation mechanism (with or w/o increased cooperation) | | | | | | |

Note: Policy pathways marked with * have already been pre-assessed within the quantitative interim anaylsis conducted in work package 4, see section 4.2 of this report.

# 3 Assessment criteria for identifying the main alternatives
## - Advantages and drawbacks, synergies and conflicts

*In addition to the elaboration on policy pathways for a harmonisation of RES(-E) support beyond 2020 at EU level, the identification of evaluation criteria formed the second pillar of the inception phase of the beyond2020 project. This section provides a brief summary of key findings related to the identification of these assessment criteria, serving as basis for the follow-up evaluation of policy pathways.*

*Please note that the report D2.2 "Assessment criteria for identifying the main alternatives - Advantages and drawbacks, synergies and conflicts" (Del Rio* et al. *(2012b)) provides further insights on the topic discussed in this section for the interested reader. This report is available for download at [www.res-policy-beyond2020.eu](http://www.res-policy-beyond2020.eu).*

This section summarises the key outcomes of the definition of evaluation criteria for the evaluation of RES policy harmonisation options. In order to evaluate the impacts of the aforementioned policy approaches, a set of evaluation criteria is required. For the detailed reasoning used in the selection of these criteria, integrating theoretical concepts and the practicability of the procedure for assessing these criteria, we refer to the corresponding detailed report (Del Rio, 2012b).

The assessment criteria proposed in this project are generally those considered in the assessments of environmental and energy policies. The identification of *a priori* relevant assessment criteria will draw on a literature review, including European Commission documents. This will provide a solid justification for the choice of those criteria, which will later prove their relevance within the empirical study as scheduled within work package 6 of this project. In addition, the interactions between different assessment criteria need to be considered. This requires a holistic perspective on the criteria, involving an analysis of how they relate to each other (i.e. synergies and conflicts).

## 3.1 Method of approach for the identification of criteria

In order to identify relevant "*a priori*" criteria and their interactions, we draw heavily upon existing concepts from both the environmental economics and the innovation economics literatures, which are deemed relevant in the context of this project. This has been complemented with some insights from other streams of the literature, including the literature on learning effects, the political science literature, the empirical literature on RES-E policy support schemes and literature on EU harmonisation of RES-E support schemes. Commission documents have also been analysed in order to infer relevant criteria. Furthermore, guidelines in existing policy documents have been considered (Mitchell *et al* (2011), HMG (2011)).

The aim at this stage is not to propose a definitive set of relevant criteria but rather to provide a filter: i.e. to reduce the range and quantity of possible criteria to something manageable. This would lead to a list of criteria whose relevance will be judged by stakeholders in the empirical research carried out in work package 6.

## 3.2 Summary of criteria identified

Taking into account the aforementioned literature, we are able to identify key criteria for the assessment of RES-E support schemes. This section provides a brief discussion of those criteria and justifies their relevance.

### 3.2.1 Effectiveness

One main criterion on which to judge the success of RES-E support schemes is obviously the extent to which instruments are effective in triggering deployment. An instrument is said to be effective if it is able to achieve a significant RES-E deployment or a certain RES-E target.

Effectiveness may refer either to increased generation or increased capacity. It can be defined in relative terms: i.e. as a percentage of total electricity or energy consumption (as set in the previous Directive 77/2001/EC and in the current Directive 28/2009/EC).

On the other hand, when assessing the effectiveness of a support scheme, the renewable energy potentials of countries should be taken into account and the increase in deployment adjusted accordingly. This is done in the OPTRES, futures-E and RE-Shaping projects, in which the effectiveness of a policy scheme for the promotion of renewable electricity is measured as the increase in normalised electricity generation due to this policy, compared to the additional available renewable electricity generation potential or the gross electricity consumption (Ragwitz *et al* 2007). More specifically, the effectiveness of a Member State's policy is interpreted as the ratio of the change in the normalised electricity generation over a given period of time and the additional realisable mid-term potential until 2020 for a specific technology, where the exact definition of effectiveness reads as follows:

$$E_n^i = \frac{G_n^i - G_{n-1}^i}{ADD - POT_{n-1}^i}$$

$E_n^i$ Effectiveness Indicator for RES technology i for the year n

$G_n^i$ Electricity generation potential by RES technology i in year n

$ADD - POT_n^i$ Additional generation potential of RES technology i in year n until 2020

This definition of effectiveness has the advantage of giving an unbiased indicator with regard to the available potentials of a specific country for individual technologies. Member States need to develop specific RES-E sources proportionally to the given potential to show the comparable effectiveness of their instruments (Ragwitz *et al* 2007).

However, another, not mutually exclusive definition of effectiveness has proven relevant in the context of the EU. This concerns target attainment: i.e. the extent to which targets for the penetration of renewable energy are fulfilled and the trend towards the fulfilment of those targets over time (as in the interim targets in the current EU RES Directive).

### 3.2.2 Cost-effectiveness

Cost-effectiveness generally refers to the achievement of a given RES-E target at the lowest possible cost to society. Environmental Economics sets a clear criterion for cost-effectiveness in reaching a target: i.e. the equimarginality principle. This refers to static efficiency and welfare gains. Cost-effectiveness is attained when an instrument encourages proportionally greater RES-E deployment by those firms and installations with lower RES-E deployment costs, and lower RES-E deployment by companies with higher deployment costs. This leads to an equalisation of marginal costs across firms/plants (equimarginality). The extent to which an instrument encourages the choice of technologies, sizes and places which minimise generation costs is thus a key aspect. This would lead to a minimisation of generation costs across firms/countries.

Since renewable energy has higher generation costs than traditional power generation technologies, they need public support to penetrate the market, the cost of which is ultimately paid by consumers and/or taxpayers. While part of the literature has focused on the minimisation of generation costs, some have argued about the need to reduce the overall policy costs for consumers or taxpayers (Huber *et al* 2004, Ragwitz *et al* 2007, Steinhilber *et al* 2011, EC 2008, IEA 2008, IEA 2011).

Thus, the costs of support should also be taken into account. RES-E support is, in the end generally paid by electricity consumers in their electricity bills. Therefore, cost-effectiveness has been interpreted in this context as supporting a given amount of RES-E at the lowest possible consumer costs.[5] In this case, the aim should be to minimise the revenues for producers (to sufficient and appropriate levels).[6] Figure 2 (below) illustrates the different cost elements.

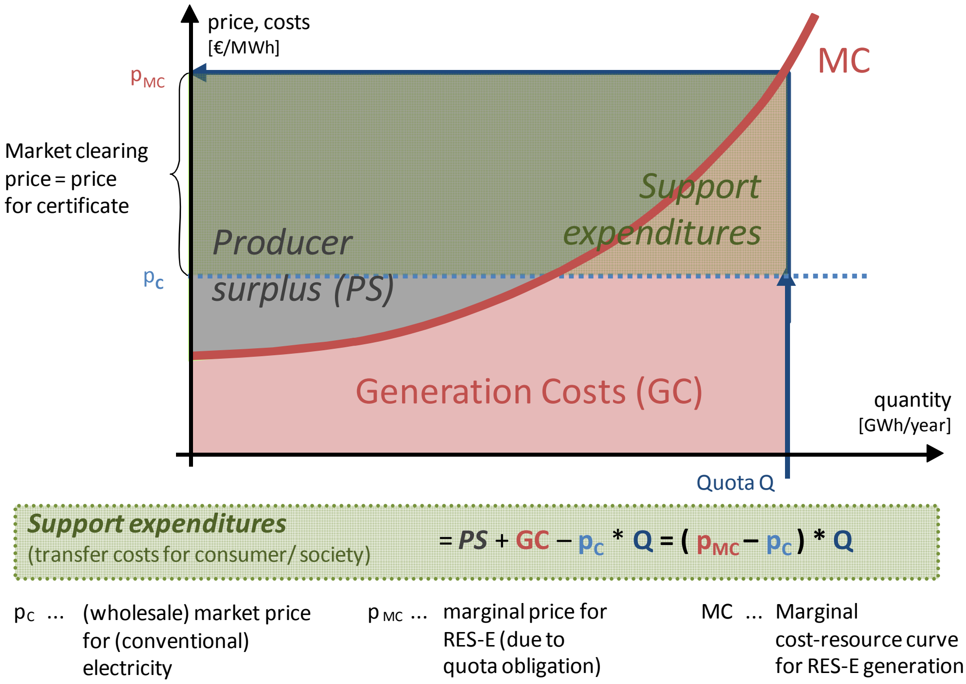


**Figure 2 Illustrating different cost concepts**
Source: Huber *et al* (2004) and Resch *et al* (2009).

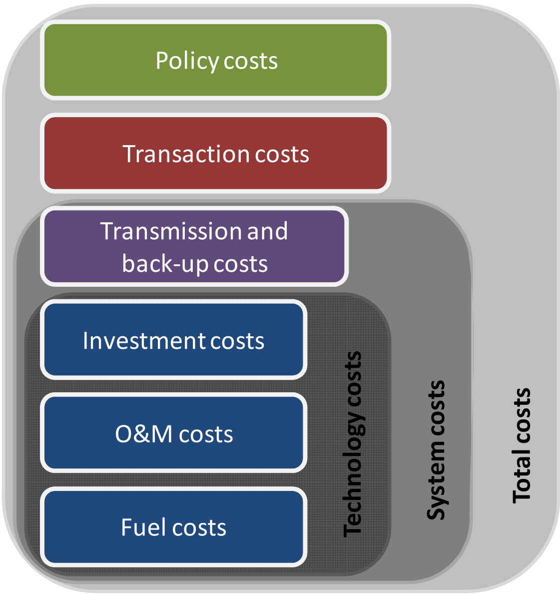


**Figure 3 Illustrating the different categories of costs**
Source: Own elaboration.

[5] See, e.g., Huber *et al* 2004, EC 2008, Ragwitz *et al* 2007, IEA 2008, IEA 2011, Mitchell *et al* 2011, among others.

[6] Costs for consumers due to RES-E support are defined as transfers from consumers to producers due to RES-E support with respect to the consumer costs due to the purchase of conventional electricity.

The transaction costs related to the implementation and functioning of an RES-E support scheme should also be included in the definition of cost-effectiveness. Transaction costs may fall on the public administration or on companies. The former are usually called "administrative costs". Other costs of RES-E deployment should be taken into account, namely transmission and distribution costs, and back-up costs.

System costs include: technology costs (investment costs, capital costs, O&M costs and, in the case of biomass, fuel costs); transmission costs; and back-up costs. System plus policy costs plus transaction (administrative) costs would lead to total costs, as illustrated in Figure 3.

### 3.2.3 Dynamic efficiency

Dynamic efficiency refers to the ability of an instrument to generate a continuous incentive for technical improvements and costs reductions in renewable energy technologies: i.e. an incentive positively to influence technological change processes in the medium and long term. This is a key benefit of investing now in renewable energy technologies because, while RES-E is not a cost-effective means of reducing $CO_2$ emissions today, it may be so in the future if investments are made now to accelerate its development. In contrast to the cost-effectiveness criteria, which are much more concerned with the short term, dynamic efficiency is key in a problem with long-term horizons such as climate change. Future targets regarding GHG emissions and renewable energy are unlikely to be less ambitious than today and, thus, technological change will continue to be a key element in both realms.[7]

Those RES-E support instruments which favour the commercialisation of expensive technologies in niches tend to lead to quality improvements and cost reductions; this will allow us to have renewable energy technologies in the future to comply with more ambitious renewable energy and emissions reduction targets at reasonable costs. If currently expensive mitigation technologies have a large cost reduction potential with increased diffusion (as shown by several studies for energy technologies, see for example IEA 2008), then supporting them today would lead to welfare benefits in terms of intertemporal mitigation efficiency (i.e. cost-effectiveness in the short, medium and long term). In contrast to cost-effectiveness, dynamic efficiency has an intertemporal perspective on costs.

Several authors have emphasised the implications of the path-dependent character of technological change on climate policy (see, for example: Rip and Kemp 1998; Unruh 2000; and Marechal 2007). If currently expensive technologies with significant potential for quality improvement and costs reduction are not supported today, a vicious circle may ensue: they will remain expensive because they have not been adopted, and they will not be adopted because their high costs make them unattractive for potential adopters.[8]

The impact of RES-E support schemes upon innovation in renewable energy technologies has several aspects or "dimensions": diversity; research and development (R&D); learning effects; and competition (del Río 2012). Some are related to other criteria.[9]

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[7] The need for a large-scale deployment of renewables to reduce $CO_2$ emissions is common in the projections made with simulation models. For example, according to projections made by the IEA in its 2008 report on energy technology perspectives, by 2050 the increased use of renewables would contribute 21% to $CO_2$ emission reductions in the BLUE map scenario (the one compatible with 450ppm concentration levels) with respect to the reference scenario.

[8] The importance of these dynamic efficiency effects is shown by both renewable energy models and climate change models (see, e.g., Stern, N. (2006)).

[9] One of the "sources" of technological change (spillovers from activities undertaken in unrelated sectors) is not included in this paper because, as argued by Clarke *et al* (2008), a substantial component of spillover effects is exogenous from the perspective of the home industry. Thus, RES-E support instruments are largely ineffective to trigger these effects. Other factors contributing to reductions in technology costs – such as economies of scale, greater size and economies of scope – have also not explicitly been included, although,

### 3.2.4 Equity

Even if an instrument leads to net benefits for society as a whole, there will be winners and losers. The distributive impacts upon consumers, citizens, sectors, firms or countries should be considered when designing climate policies at any level (global, European, national or regional). The social acceptance of a given policy depends to some extent upon how those distributive impacts are handled. In the context of this project, distributive concerns are mostly related to winners and losers at the national level (countries): i.e. who pays for and who benefits from a given instrument or design element. In particular, it should be identified whether a given instrument leads to a concentration of the costs of RES-E promotion in a limited number of countries. While minimisation of the total costs of complying with RES-E targets is part of the cost-effectiveness criterion, compliance costs may fall disproportionally upon countries with lower GDP per capita. As argued by Capros *et al* (2008) in the case of compliance with EU GHG targets, this result was considered by the European Commission to be inconsistent with the equity and fairness criteria which have been set as basic policy principles by the EU.

### 3.2.5 Environmental and economic effects

The deployment of RES-E projects may bring positive effects for the countries where they are located, as well as to the EU as a whole. Here, we take into account two of those potential positive effects of RES-E deployment at the EU level: environmental and economic effects. The former refers to reduction in GHG emissions and local pollutants, while the latter concerns avoided fossil fuel consumption, which positively affects the trade balance (exports minus imports). While other co-benefits are likely (including: net job creation; industry creation; and exports of renewable energy technology equipment), they cannot be quantified within this project. Finally, it is important to take into account that environmental impacts are not necessarily positive, but may also be negative (visual, land use). However, we only focus on the former here.

### 3.2.6 Socio-political feasibility

The implementation of a system which meets all of the aforementioned criteria may still not be socially acceptable and, thus, politically feasible. Social rejection may be of a general nature (i.e., civil society is against the deployment of renewables or against deployment support) or it may have a local character (the so-called 'NIMBY' syndrome).

Likewise, social acceptability is related to the existence of real or perceived local environmental and socio-economic benefits for specific Member States (MSs) or regions. It may also be related to other criteria. For example, an expensive support scheme is unlikely to be socially acceptable to the general population (consumers).

The (perceived) social acceptability of RES-E policies at the MS level can be assumed to translate into a preference of national policy-makers for a specific pathway (or combination of pathways). Indeed, the political feasibility of a given instrument is related to equity concerns, environmental and economic effects, and social acceptability, any of which may result in significant conflicts with specific countries or interest groups. Although the European Commission makes legislative proposals, the Member States and the elected representatives of their populations, in the Council and European Parliament respectively, get to vote on those proposals, and it is ultimately a question whether the required majority can be achieved.

Thus, political feasibility – within the legislative procedures of the European Union, as well as at national level – deserves separate consideration. Political feasibility depends upon the distribution of the costs of reaching the targets, and awareness of potential local benefits.

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since economies of scale are related to effectiveness in support, they are implicitly treated under the "learning effects" dimension, which basically depends upon effectiveness in deployment.

The assessment takes place in two steps: first, one has to look at the role which MSs play in the relevant legislative procedure for each policy pathway. Unanimous decisions are harder to achieve than voting under a qualified majority rule, for example. Then, and based upon the role of the MSs, one can ask whether there are "historic" or other preferences among policy-makers in the Member States which may influence their vote on the measure.

### 3.2.7 Legal feasibility

The criterion of legal feasibility has two aspects: legislative competence; and compatibility with other EU primary and secondary law.

First, one has to examine whether the Union has competence to legislate with regard to each specific pathway to be examined, and which provision could be an appropriate legal basis for such legislation. The EU only has the competence conferred upon it by the Treaties. The legislative competence of the European Union in the field of energy is specifically addressed by Article 194 of the Treaty on the Functioning of the European Union (TFEU), as introduced by the Lisbon Treaty. According to Article 3(2)(i) TFEU, the European Union and the Member States share competence on energy issues, meaning that they can both legislate; however, Member States are competent where the European Union has not (yet) exercised its competence (Article 2(2) TFEU).Of particular importance in this assessment will be the "new" energy competence created by Article 194 TFEU. This first step will result in the definition of a legal basis, or the conclusion that there is no legal basis: i.e. in a clear "yes or no" answer to the question whether the pathway is, *prima facie*, legally feasible.

In a second step, all of the provisions of EU primary and secondary law which could be affected have to be listed and the compliance of each respective pathway has to be assessed. So far as EU primary law is concerned, those would be (for example) the rules of the internal market, in particular on free movement of goods and competition (including State aid). For EU secondary law, one needs to look at the existing secondary legislation on the internal energy market.

It should be noted that, for the different RES-E pathways, different provisions of EU primary and secondary law may be triggered. With regard to results, the second evaluation step may lead to a clear answer as regards legal feasibility as well: if the policy pathway does not comply with EU primary and secondary law, then the respective pathway could not be adopted. However, since – depending upon the policy pathway in question – different provisions of EU primary and secondary law may be triggered, and for some policy pathways more (or at least more intensively or strongly) than for others, this evaluation step will additionally involve a "ranging exercise": some policy pathways may be classified as being "more feasible" than others from a legal perspective.

Table 6 summarises the above discussion on different criteria.

**Table 6 Brief characterisation of the criteria**

| Criteria | Brief characterisation |
|---|---|
| **Effectiveness** | Increase in RES-E generation adjusted by national potentials. Attainment of RES-E targets |
| **Cost-effectiveness** | Minimisation of generation costs and minimisation of policy support costs. Transaction costs (whether they fall on private or public entities) and other costs (costs of grid reinforcement and extension and back-up costs) should also be taken into account. |
| **Dynamic efficiency** | This criterion refers to the impact of RES-E support instruments, which are mostly "diffusion", market-pull instruments, on previous stages of the innovation process in renewable energy technologies. |
| **Equity** | RES-E support instruments have distributive impacts. A pathway may have less beneficial effects on certain countries and there will certainly be winners. Within countries, distributive impacts between producers and consumers are also a major concern. Share of the market between different RES-E producers (independent power producers vs. large utilities) is also important in this respect. |
| **Environmental and economic effects** | RES-E deployment triggered by RES-E policy has unavoidable local impacts of a different nature: socio-economic, environmental and otherwise. |
| **Socio-political acceptability** | RES-E support policies may not be socially acceptable and may be rejected by the population. Social rejection may be a general aspect (i.e., civil society is against the deployment of renewables or against deployment support) or may have a local character (the NIMBY syndrome). Social acceptability and political feasibility go hand-in-hand. Political feasibility refers to the attractiveness for policy makers of a given RES-E support instrument or pathway and it is critically affected by equity, environmental and economic effects and social acceptability. |
| **Legal feasibility** | This criterion refers to whether the EU has competence to legislate a given pathway (legal basis) and whether the policy pathway complies with EU primary and secondary law. |

The above criteria can be made more specific by defining an initial set of indicators for each of them, which will be further refined in later work. Work package 6 (synopsis, conducting an integrative multi-criteria assessment) is specifically devoted to the analysis of the relevance of those criteria for stakeholders. These indicators are proposed in the Table 7 below.

**Table 7 Initial set of proposed indicators pertaining to different criteria**

| Criteria | Indicator |
|---|---|
| **Effectiveness** | • Ratio of the change in the normalised electricity generation during a given period of time and the additional realisable potential for a specific technology for each pathway<br>• Target fulfilment (interim and final targets) |
| **Cost-effectiveness** | • Generation costs (investment costs, capital costs, O&M costs and fuel costs for biomass)<br>• Transmission costs (costs of grid reinforcement and extension)<br>• Back-up costs<br>• Policy support costs<br>• Transaction (incl. administrative) costs |
| **Dynamic efficiency** | • Technological diversity (degree of deployment of more expensive or relatively immature technologies, measured as percentage deployment of different technologies with respect to potentials by country)<br>• Development of investment costs over time (€/kW) |
| **Equity** | • Total policy cost for a Member-State per unit of GDP (or GDP per capita)<br>*Of relevance: Minimisation of variation of criterion value across Member-States* |
| **Environmental and economic effects** | • GHG emissions, air pollution<br>• Reduction of fossil fuel imports in different pathways: trade balance affected (avoided fossil fuel consumption from Green-X) |
| **Socio-political acceptability** | • Revealed preference of (national) policy-makers for a specific pathway.<br>• Procedures for adoption of the respective policy pathway and role of the MS (unanimity decision or qualified majority) |
| **Legal feasibility** | • Does the EU have competence to legislate the specific pathway (legal basis / lack of legal basis)? (Yes/No answer)<br>• Does the policy pathway comply with EU primary and secondary law? (Likert scale). |

## 3.3 Interactions between criteria

In the literature on renewable electricity support schemes, criteria have traditionally been proposed as a checklist, and thus have been represented and assessed independently of each other. In reality, however, criteria are interrelated. Thus, the interactions between different assessment criteria may need to be considered. The aim is to identify possible synergies and/or conflicts between them.

The criteria established above do involve various overlaps *inter se*. This is unavoidable, since there are mutual interactions between criteria. There is no way in which we can remove one criterion and/or integrate several of them without losing relevant perspectives for the assessment of pathways. Criteria are inclusive of all relevant aspects, even if this means that one is partially (but never totally) included in others. For example, high consumer costs (cost-effectiveness) affect social acceptability. But social acceptability also depends upon the local benefits of deployment and upon how costs and benefits are distributed among different socio-economic actors (equity). In turn, the existence of local benefits depends upon effectiveness in deployment, which overlaps with dynamic efficiency to create a national industry upstream from the innovation process in renewable energy technologies. Finally, political feasibility depends, on the one hand, upon the interaction between social acceptability, cost-effectiveness, local benefits and equity, and, on the other hand, upon the juridical criteria.

Criteria may certainly be in conflict with each other. For example, a greater level of local benefits may come at the expense of cost-effectiveness in meeting EU targets. This means that if national policy-makers are interested in the local benefits of renewable electricity, deployment may not occur in those places with a better renewable resource potential in the EU. Another example of a conflict is between consumer costs and dynamic efficiency. Lower profit margins for renewable generators would lead to a lower cost for consumers. But it could also lead to lower incentives for innovation, if innovation results from reinvesting the profit that is obtained by renewable generators into new technologies (developed by equipment producers), although the evidence from the German and Spanish solar PV industry is not so clear in this regard. In general, a conflict between static and dynamic efficiency could occur if existing, cheaper technologies were to lock out promising technologies with a large cost-reduction potential.

But, on the other hand, there might also be synergies. For example, effectiveness in the deployment of different technologies would encourage dynamic efficiency by facilitating technological diversity and allowing technologies to advance along their learning curves. Furthermore, the existence of a market feeds back into the R&D stage and, thus, deployment triggers R&D investments.

Another example of a synergy between criteria is between static efficiency and political feasibility, insofar as low consumer costs enhance social acceptability and, thus, political feasibility. In contrast, windfall profits undermine cost-effectiveness, equity, social acceptability and political feasibility. Equity and political feasibility are also obviously interrelated. Note that, in this section we have separated the criteria concerning socio-political feasibility into two sub-criteria (social acceptability and political feasibility) to grasp relevant interactions between them and other criteria. However, it is very difficult to disentangle both sub-criteria. A socially unacceptable pathway will also almost certainly be politically infeasible.

It may come as a surprise that static efficiency (consumer costs) and effectiveness are positively related through lower investment risks (see Mitchell *et al* 2006, Ragwitz *et al* 2007). This is so if an RES-E support scheme which is effective in deployment (because it provides a stable flow of revenues) would be regarded as less risky. In turn, lower risks obviously entail a lower risk premium and, thus, lower levels of support would be required, which involves lower consumer costs.

Therefore, a holistic perspective on the criteria is required, whereby their mutual relations (synergies and conflicts) are made explicit. This may help to build a hierarchy of criteria, whereby criteria and sub-criteria are related and some are shown to be instrumental in achieving others. The aim is to produce a figure identifying those interactions. Figure 4 and Table 8 picture and summarise those interactions. Further details are provided in the D2.2 report (Del Rio *et al.* (2012b)).

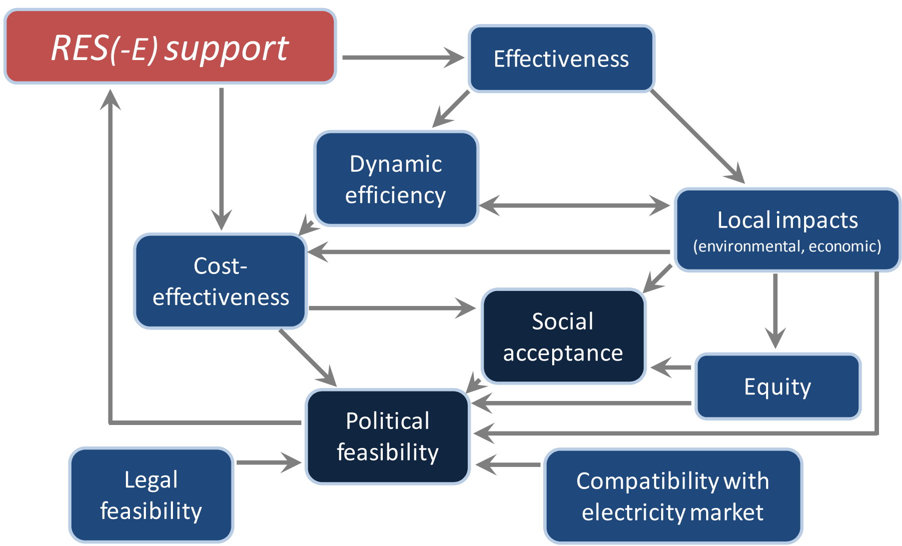


**Figure 4 Picturing the interactions between criteria**
Source: Own elaboration.

**Table 8 Illustrating the interactions between criteria**

| *From (columns) /to (rows)* | **Effectiveness** | **Cost-effectiveness** | **Dynamic efficiency** | **Equity** | **Local impacts** | **Social acceptance** | **Political feasibility** | **Legal feasibility** |
|---|---|---|---|---|---|---|---|---|
| **Effectiveness** | | | | | | (indirect effect through political feasibility) | Regulatory stability as a result of political feasibility favours deployment | |
| **Cost-effectiveness** | | | Innovation positively influences cost-effectiveness (techno-cost reductions) | | | | Regulatory stability results in lower risk premium | |
| **Dynamic efficiency** | Market creation leading to learning effects and private R&D | | | | | | | |
| **Equity** | | | | | Local impacts have equity effects some of which are difficult to predict | | | |
| **Local impacts** | Deployment leads to local impacts | | Creation of a local industry and impacts upstream the innovation process (technology diversity). | | | | Indirectly through impact of political feasibility on effectiveness | |
| **Social acceptance** | | Greater consumer costs reduce social acceptance | | Distributive impacts of the support scheme affects social acceptance | Benefits of RES-E deployment results in social acceptance | | | |
| **Political feasibility** | | High consumer costs make continuation of support scheme unlikely | | Inequitable schemes are politically unfeasible in the long-term | Greater local benefits make the continuation of support politically feasible | Social acceptance is a crucial element of political feasibility | | If the instrument is not legally feasible it can not be political feasibility. Not the other way around. |
| **Legal feasibility** | | | | | | | | |

# 4 The forthcoming impact assessment of RES policy pathways – interim findings and next steps

## 4.1 Legal aspects – assessment and guidelines for practical implementation (work package 3)

*In work package 3 of beyond2020, a legal analysis will be conducted in order to assess the implications of harmonisation for national and supranational legislation. This assessment will follow a three-stage approach. In the first stage, potential areas of conflict will be identified. Therefore, each harmonisation option will be evaluated with regard to its compatibility with EU primary and secondary legislation. The second stage of the assessment will focus on legal requirements that need to be respected and fulfilled in order to implement each option. The assessment will be concluded with the third stage, which will consider the pros and cons of the different harmonisation options. All identified policy options will be weighed against each other in order to assess which option would be the most suitable and feasible to be implemented in the EU in legal terms.*

*First findings related to the identification of potential areas of conflict of a harmonisation of RES support with EU law are summarised in the report D3.1 "Potential areas of conflict of a harmonised RES support scheme with European Union Law" (Fouquet* et al*. (2012)),*[10] *available for download at www.res-policy-beyond2020.eu.*

### Objectives

Work package 3 has been included into the project in order to ensure that the policy pathways assessed and the recommendations ultimately made are not simply "wishful thinking" but can in practice be adopted and implemented. In short, they have to be legally feasible. However, legal feasibility falls into two parts: first, there needs to be a legal basis somewhere in the Treaties, thus a provision saying that the Member States have conferred parts of their national sovereignty and their own legislative competence to the European Union. Second, any measure adopted needs to be consistent with EU primary and secondary law and policies. Legal feasibility thus clearly sets some limits with regard both to what is possible at all and how it can be done.

Thus the objective of this work package was and is to set out an initial framework for the assessments done in the other work packages and further to direct them and guide the project in focusing on the more (legally) realistic approaches. It further aims at shaping those policy pathways in such a way that they can ultimately be recommended, not only as being desirable in terms of various other key parameters (such as effectiveness, efficiency, etc), but also in practice (legally) feasible. At the same time, the legal analysis will highlight certain procedural requirements of EU-level decision-making (which are tied to the relevant legal basis): these procedural issues also have implications for the political feasibility of certain proposals under the EU system (e.g. voting rules requiring unanimity in the Council, legal bases involving stronger or weaker influence for the European Parliament, etc).

[10] This report serves as a general overview of all the Articles and provisions in EU primary and secondary law which may have an impact the European Union's (EU) legislative competence in the field of renewable energy support. It neither yet assesses them in detail nor sets out which provisions would be relevant with respect to the different degrees of harmonization or under the different policy pathways identified in the course of the beyond2020 project. Rather, it presents them and gives a legal scholarly interpretation of the respective provisions with respect to legislation to support renewable energy.

### *Methodology*

First, and to give an overview of the complexity of the issue, Deliverable 3.1 created a sort of inventory, presenting and explaining all the provisions of EU primary and secondary law that could become relevant for any kind of degree of harmonization or policy pathway to be looked at in the course of the project.

As a second step, assessment of the different policy pathways has commenced, first concerning whether there is a legal basis for such approaches, and then with regard to their compliance with EU primary and secondary law and policies.

However, for the first question of whether or not there is a legal basis for the various possible policy approaches, it is typically more important to establish the degree of harmonisation involved under any given pathway, so that various (elements of certain) pathways could be considered together in this respect. The caveat in Article 194(2) TFEU, which in some way or other limits the EU's harmonization competence in the field of energy, is central to the analysis of each and every degree of harmonization. The different possible interpretations of this caveat (no EU legislative competence at all in the relevant areas; a unanimity voting requirement; or the possibility of an individual opt out for the Member States) are being discussed and elaborated under work package 3, which will lead to an assessment of their respective impact on the legislation that could or could not be adopted.

With regard to the question of consistency with EU law requirements, distinctions will be drawn between the different policy pathways. However, one important discussion focuses on the subsidiarity and proportionality of the proposed approaches: here, again, the degree of harmonization will be more relevant than the policy pathway within that degree, and will have potentially significant implications for the political process of negotiating any legislation in this area (whereas the legal constraints imposed by such considerations have, historically, been rather less stringent).

Third, and alongside the assessment of the different policy pathways, the preliminary results of the legal analysis will continue to be brought into the other work packages, making sure that whenever details about the different design elements of one or other policy pathway are decided upon, this is done in a manner ensuring their consistency with EU law, and thus their legal feasibility. In this regard, features that could be relevant for different policy pathways will be shaped in a way that is most consistent with EU law.

The recommended approaches will thus not only be legally feasible, but also consist of measures which are shaped so as to offer a good fit with the framework of EU primary and secondary law.

## 4.2 Cost-benefit analysis of economic and environmental aspects (work package 4)

*The core objective of work package 4 is to conduct a quantitative model-based analysis of future RES deployment and corresponding cost, expenditures and benefits for each assessed policy scenario based on the Green-X model, considering economic and environmental aspects. The investigated cases aim to describe the wide variety of possible future RES policies in Europe and allow the assessment of the consequences of such policy choices briefly.*

*First findings related to a pre-assessment of selected policy options for a RES strategy beyond 2020 will be summarised in the report "Cost-benefit analysis – initial results of the quantitative assessment of RES policy pathways beyond 2020" (Resch* et al*. (2012)). This report will then be uploaded at the project web site www.res-policy-beyond2020.eu.*

## *Objectives and tasks*

The core objective of this work package is to conduct a quantitative model-based analysis of future RES deployment and corresponding cost, expenditures and benefits for each assessed policy scenario based on the Green-X model, considering economic and environmental aspects. The scenario calculation will be performed by the application of the *Green*-**X** model, indicating the consequences of policy choices in a comprehensive manner. Targeted information on support expenditures, investment needs, and environmental and economic costs and benefits will be provided, which forms the basis for the subsequent cost-benefit analysis based on indicators.

Building on previous (and currently ongoing) analyses (i.e. the outcomes of previous projects such as, e.g., the IEE projects futures-e and RE-Shaping, and studies done on behalf of the European Commission such as FORRES 2020, PROGRESS) it is the aim of this work package to undertake a comprehensive assessment of the different policy pathways with respect to a harmonisation of RES(-E) support in Europe. Thus, the investigated cases aim to describe the wide variety of possible future RES policies in Europe and allow the brief assessment of the consequences of such policy choices. More precisely, a broad set of at least seven different policy cases will be investigated in a detailed manner. From the geographical and time perspective, scenarios represent future projections at country and EU level on a yearly base up to 2030 (with brief outlooks for 2050 for selected key paths at EU level), whilst from the policy perspective a wide variety occurs – from uncoordinated national policies up to coordinated or harmonised support schemes, respectively.

Sensitivity runs will be performed for different values with regard to, e.g.: technological learning, energy prices and energy demand developments, investor risk, and the feasibility of tapping future RES potentials in the long term (based on infrastructure prerequisites).

## *Pre-assessment of selected policy pathways*

Several policy dimensions relate to the debate on a future RES strategy for Europe beyond 2020. These include:

- RES support instruments and financing aspects related thereto;
- Electricity market design and impacts on market functioning arising from an enhanced use of (volatile) renewable energy sources;
- Sustainability concerns, in particular related to the use of biomass;
- Cooperation with third countries, in particular imports (to the EU) of biofuels and solid biomass, as well as renewable electricity (RES-E).

Generally, future policy choices related to the above dimensions might show a more national orientation or could reflect further consolidation and cooperation among Member States, whereby the ultimate outcome would be a harmonised approach across the EU.

### Scenario definition and related key assumptions

Interim scenarios conducted with the Green-X model at the beginning of 2012 have addressed specifically the role of RES support schemes and related impacts on financing. Figure 5 provides an overview of the limited set of policy cases assessed during the interim analysis conducted within beyond2020. It also sketches the linkages between the European Commission's principal policy options[11] with detailed implementation concepts: i.e. the defined RES policy pathways. Although the number of assessed cases appears limited, they cover a broad spectrum of feasible pathways to contribute best to the ongoing open policy debate. These policy alternatives were chosen as repre-

[11] Taking into consideration stakeholder perceptions, in its impact assessment annexed to the recent Communication "Renewable Energy: a major player in the European energy market" the European Commission presented four principal policy options with respect to a post-2020 framework for RES, ranging from "business as usual" (assuming no new EU RES policy beyond 2020) up to the establishment of an EU RES target complemented by harmonised measures: compare European Commission (2012a and 2012b).

sentative of the main options, in order to identify the key implications of different courses of action.

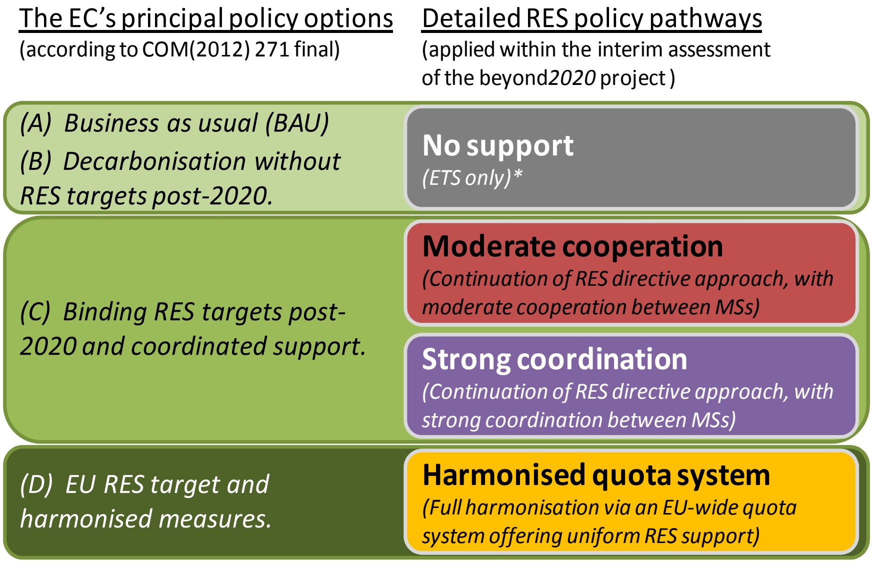


**Figure 5 A European RES policy beyond 2020 - from principal policy options to detailed implementation concepts**

Note: * The level of the carbon price reflects the ambition to achieve (long-term) decarbonisation (i.e. BAU versus strong GHG reduction commitment).

In accordance with Figure 5, the RES policy cases which we have analysed can be characterised as follows:

- *No Support:* Under this option, no binding RES targets would exist for 2030. Instead, the ETS represents the key driver at EU level for low carbon technologies in the period beyond 2020, under which two variants are considered: a scenario of "low carbon prices" corresponding to the Commission's policy option of a "business as usual" development; and a case of "moderate to high carbon prices", reflecting a decarbonisation without dedicated RES targets post-2020.
- *Extension of the RES Directive with either moderate cooperation or strong coordination between Member States.* Both pathways build on the assumption that the current policy framework as given by the RES Directive (2009/28/EC) will be prolonged for the period up to 2030, meaning (*inter alia*) that national RES targets for 2030 will be established. Similar assumptions are consequently made for RES support – i.e. a continuation of strengthened national RES policies until 2030. Differences are, however, assumed with respect to the level of cooperation / coordination:
    - *Moderate cooperation.* This case reflects a stronger but still limited use of cooperation mechanisms, where MSs primarily aim for domestic RES target fulfilment and, consequently, only "moderate cooperation" with other MSs will arise from that.
    - *Strong coordination.* A "European perspective" is taken under the second variant which can be classified as "strong coordination", where efficient and effective RES target achievement is envisaged at EU level, rather than simply the fulfilment of each national RES target using domestic resources.
- *Harmonised Quota System.* The impact of a harmonisation of RES support is analysed under this policy option, assuming that harmonised RES policies come into effect by 2021. The discussion of harmonisation is, however, reduced to its most prominent representative: a harmonised quota system offering uniform support for all RES options across the EU. It can be expected that this would give a strong incentive for the full exploitation of least-cost tech-

nologies, while placing less emphasis on novel innovative options in the short term. The fulfilment of the 2030 RES target at EU level is envisaged in the applied quota obligation, accompanied by an EU-wide certificate trading scheme for RES in the electricity sector.[12]

- This policy assessment complements and partly updates the previous related modelling activities – e.g. the quantitative assessment of RES policy options as conducted within the IEE project futures-e (see e.g. Resch *et al*., 2009) in the 2020 context, or the European Commission's "Energy Roadmap 2050" (European Commission, 2011) containing recent PRIMES modelling of feasible energy pathways for achieving long-term carbon commitments. Note that, in order to assure consistency with other related studies at EU level, the key assumptions on the conventional reference system, energy and carbon prices as well as energy demand were based on these general energy scenarios, in particular on the PRIMES "high renewables" case. Moreover, similar to this PRIMES case, the targeted deployment for RES (as share in gross final energy consumptions) at EU level by 2030 was set at 31.2%[13] for all Green-X scenarios.[14]

**Interim results – RES-E deployment and related support expenditures**

Next, only a brief overview of the results gained within the interim assessment is given, indicating the key outcomes for RES policy assessment, using the example of the EU level for the electricity sector only: see Figure 6 and Figure 7.

More precisely, Figure 6 illustrates the feasible RES-E deployment over time (left) as well as by 2030 (right), indicating the penetration of new RES-E installations within the observed time frame. It becomes evident that, without dedicated support, RES-E deployment would stagnate after 2020, reaching a share of RES-E of 35.5% by 2030.[15] This indicates that an ETS by itself does not provide sufficient stimulus for RES-E deployment. In contrast to the "no support" case, within all other policy variants the expected deployment of RES in the electricity sector by 2030 ranges from 55.2% to 55.4%. If total RES deployment is taken into consideration, "no (dedicated RES) support" would lead to an RES share in gross final energy demand of 24.6%[16] by 2030, while in all other policy paths it appears feasible to reach the targeted RES share of 31.2% by 2030.

Figure 7 complements this depiction, indicating – in addition to RES-E deployment – the cost impact, in particular the resulting support expenditures for new RES-E installations. More precisely, Figure 7 offers a comparison of both overall deployment of new RES-E plants (installed between 2021 and 2030) by 2030 and the corresponding support expenditures (on average per year for the period 2021 to 2030) for all the assessed cases. Apparently, strengthened national RES policies complemented by moderate to strong cooperation and coordination appear suitable to keep RES well on track to reach moderate-to-ambitious deployment targets for 2030. Related support expenditures can then be maintained on a comparatively low level (at € 22.8 to € 23.5 billion as a yearly average for new RES-E installations), while the uniform RES support involved in the case of a harmonised RES trading regime (without banding) may lead to almost twice as high a consumer burden (of € 38.3 billion).

[12] Note that, generally, a suitable mixture of support instruments is also envisaged for RES in heating & cooling. Thereby, a similar conceptual approach is taken to that discussed for RES electricity, where support instruments are either harmonised or tailored to country-specific needs. In contrast to this, for biofuels in transport physical trade across the EU is assumed, meaning that support follows current practices.

[13] According to the European Commission's Energy Roadmap 2050 (European Commission, 2011) the assumed 2030 RES target can be classified as "ambitious", reflecting a decarbonisation pathway for Europe where RES are expected to become the major contributor.

[14] In the Green-X scenario of "no (dedicated RES) support", no RES target was assumed for 2030 since under this policy variant deployment represents only an outcome but not a precondition.

[15] This figure refers to the variant of low carbon prices. If moderate-to-high carbon prices are assumed, an RES-E share of 37.8% can be reached.

[16] Again, this figure refers to the case of low carbon prices. Note that in the case of moderate / high carbon prices a RES share of 26.6% appears feasible.

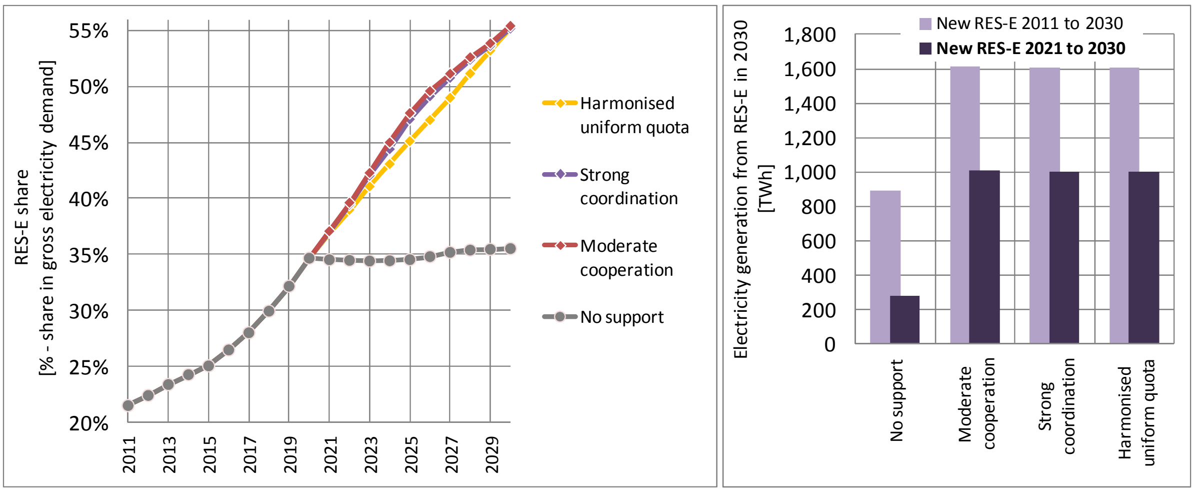


**Figure 6** **Comparison of the resulting RES-E deployment over time for all RES-E (left) as well as by 2030 for new installations only (either from 2011 to 2030, or from 2021 to 2030) (right) in the EU-27 for all assessed cases.**

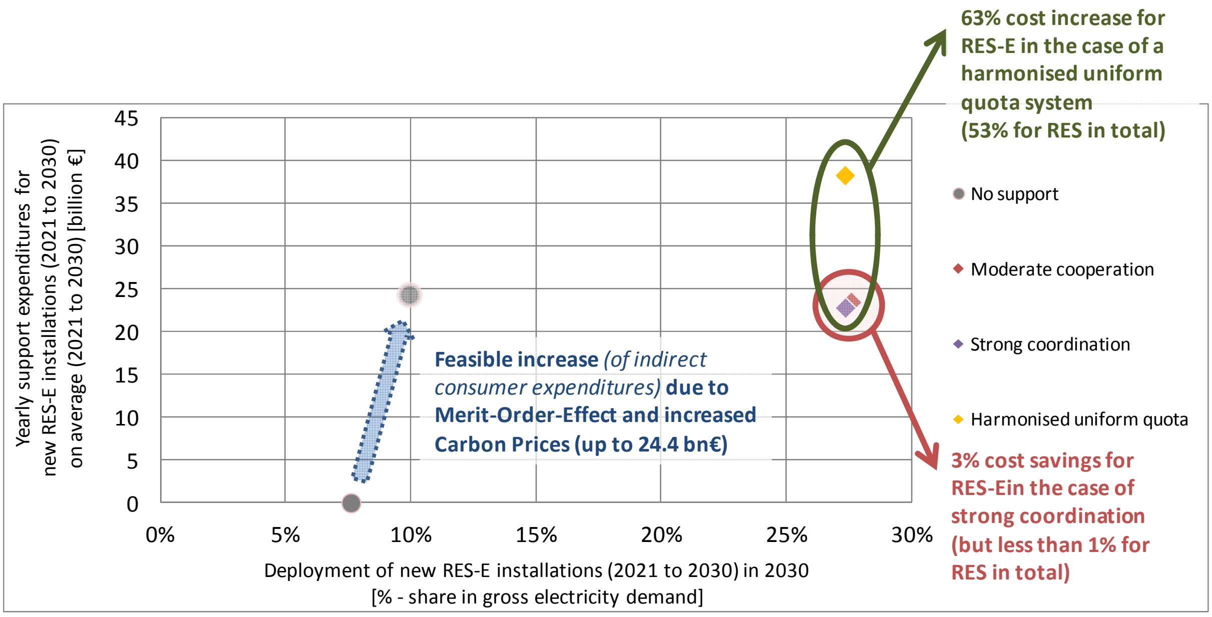


**Figure 7** **Comparison of the resulting 2030 deployment on new RES-E (installed 2021 to 2030) and the corresponding (yearly average) support expenditures in the EU-27 for all assessed cases.**

In the case of "no (dedicated RES) support", obviously no support expenditures for RES are applicable. If long-term climate targets are taken seriously, meaning that Europe strives for the 80%-95% GHG reduction by 2050, no dedicated RES support may, however, possibly cause unexpected side effects. A comparison of the two variants of "no support", characterised by either low (in the case of no strong carbon commitment) or moderate-to-high carbon prices (reflecting a strong long-term carbon commitment: i.e. an 80%-95% GHG emission reduction by 2050), indicates that, in the absence of a strong RES deployment, a rise in electricity prices may lead to an indirect consumer burden of almost similar magnitude to that involved in the case of perfectly-tailored RES policies. In the absence of continuous RES support and related expansion, this is caused, on the one hand, by a reduction of the so-called "merit order" effect that usually goes hand in hand with RES deployment. On the other hand, a lower RES-E penetration leads to higher carbon prices and, thus, also higher electricity prices, since more alternatives have to enter the (common) carbon market in order to comply with the carbon target.

**Key findings of the interim assessment**

The current RES Directive (Directive 2009/28/EC) lays the basis for the EU's RES policy framework until 2020, but a strategy and clear commitment to RES beyond 2020 is needed (if RES are to deliver what is expected). The initial results of the policy assessment indicate that cooperation and coordination among Member States appear beneficial and, indeed, are required to tackle current problems in RES markets. Thus, both of these policy options would also appear to be fruitful for the period beyond 2020. By contrast, "simplistic approaches" to RES policy harmonization (e.g. via a uniform RES certificate trading) cannot be recommended – neither in the short nor in the long term (compare also Resch *et al* (2010)).

## 4.3 Future electricity markets – design implications and trade-offs with RES-E (work package 5)

*Work package 5, named "Future electricity markets – design implications and trade-offs with RES-E", is dedicated to assess the design of the different RES policy pathways in order to derive prerequisites for and trade-offs with the common electricity market and its feasible future design, and to identify opportunities for and barriers to electricity market design and grid regulation for the integration of large shares of renewable energies.*

*For details on the work taken and/or planned and the findings so far, the reader should refer to the report D5.1 "Review report on interactions between RES-E support instruments and electricity markets" (Batlle* et al*., 2012), available for download at [www.res-policy-beyond2020.eu](http://www.res-policy-beyond2020.eu).*

### *Underlying problems and related objectives*

The introduction of renewable electricity into electric power systems, grids and therefore electricity markets creates a number of impacts, from the technical (operation and planning), economic and regulatory perspectives: first, when deployed to a significant extent, RES-E induces changes in the way generation in which systems and grids are operated; as a direct consequence, this penetration significantly changes the way that wholesale markets function and conditions market outcomes (namely changing price dynamics); and finally, and this above all, the design of markets and grid regulation has an influence on the deployment of renewables, just as the design of support mechanisms for RES-E affects the system operation and wholesale market outcomes.

There is a growing and already significant amount of work analyzing the impact of RES-E penetration on electric power systems from both the technical and economic approaches, which has indeed been considered for policy design. However, the interacting implications of electric power systems and RES-E-related regulatory design (on the one hand, the impact of wholesale market and transmission and distribution rules on RES-E development, and on the other hand the impact of RES-E support mechanism design on power systems, markets and grids) have yet to be sufficiently studied.

There might be a number of reasons behind this need for sounder analysis on the regulatory side, but two can be specifically highlighted:

- until recently, especially in the EU context, the priority has been to enhance the deployment of RES-E over the objective of optimizing the short- to medium-term efficiency of wholesale markets;
- at the same time, the regulatory design of electric power systems (regarding both wholesale markets and grids) has been conceived without taking into account the numerous impacts that an extensive (and growing) penetration of RES-E will have upon those systems.

These facts have not been an issue while RES-E penetration has not been relevant. However, when the share of RES-E in the electricity mix becomes more significant, then the saliency of the impacts, and the need to address them, becomes greater (especially in the current context of economic crisis in a significant number of Member States). The impacts of RES-E on markets and grids can be multi-faceted: RES-E affect generation units' economic dispatch, transmission and distribution grids operation, market prices, balancing needs and procedures, investment requirements, etc. Moreover, as previously mentioned, the existence and degree of these impacts will depend on the way that RES-E is promoted. Different policies will induce different types of renewables, with different characteristics (such as flexibility, dispatchability, marginal cost, etc.), and this will result in different impacts on markets and grids. For example, policies promoting fixed quotas of the different RES-E technologies will not induce the same results in markets and grids as a system based upon more volatile tradable green certificates open to any RES-E, since the planning of the rest of the generation system (the expansion of the conventional generation mix) will be affected by the uncertain future configuration of the RES-E generation side. Also, a harmonized EU policy might result in different geographical locations of RES-E plants than the one that should be expected in the current scenario, with ensuing consequences for grids and regional markets.

These impacts may in turn need to be addressed through changes in market design and grid regulation, which need to be different depending on the RES-E policy pathway, and hence on the type(s) of RES-E technologies, promoted.

## *Methodology*

Consequently, to consider those effects within the discussion on future RES support design, this work package is aiming to achieve two main objectives:

- integrated assessment of the potential policy paths proposed in the beyond*2020* project to derive prerequisites for, and trade-offs with, common electricity markets; and
- identification of opportunities for, and barriers to, electricity market design and grid regulation for the integration of large shares of renewable energies in Europe.

The first task of this work package has been to review existing studies of the interactions between RES-E and electricity markets, grid policies and regulatory designs, in order to inform future work within this work package and to lay the ground for the assessment of the impacts of different RES-E policy pathways.

Since in some cases the amount of work that can be found in the literature is rather scarce (especially on how regulatory design of RES-E, and wholesale markets and grids regulation, affects both RES-E deployment and the overall efficiency of the power system), we have delved into the development of a sound and novel discussion of these issues.

First, we have approached the discussion about the specific impact that these RES-E policy pathways can have on electric power systems' functioning and efficiency. The core of the work developed has been centred around proposing a methodology that, instead of taking the different RES-E subsidization instruments as starting point of the assessment, decomposes them into their design elements. Figure 8 illustrates a schematic overview of the methodological approach we use to assess the interactions of RES policy design with grids and markets.

The policy pathways are decomposed into design elements which are relevant with regard to their influence on the operation and investment decisions of RES-E generators, and thus on the resulting technology mix and its generation pattern. Additionally, some more general policy design characteristics consisting of framework conditions and more general elements are included within the analysis. In this approach, the technology mix resulting from the policy design is characterised through a series of highly disaggregated levels (cost structure, dispatchability / flexibility, geographical location, etc.). Based on this technology mix and its characteristics, we analyse the direct implications for electricity markets (e.g. wholesale price level, price volatility) and grids (e.g. reserve requirements, grid expansion requirements). On the other hand, we have also addressed the implications of changes in market design (e.g. intra-day markets, market coupling, etc.) and grid regulation (e.g. distribution of grid connection costs) in order to make larger shares of RES-E compatible with an efficient operation of power systems. Finally, from the interplay of both interactions we are able to derive the main constraints and cost implications induced via several RES policies in electricity markets and grids. Together with other non-economic barriers (administrative, social constraints, etc.), we use this feedback in work package 4 to determine the deployment and corresponding support costs of the assessed policy pathways.

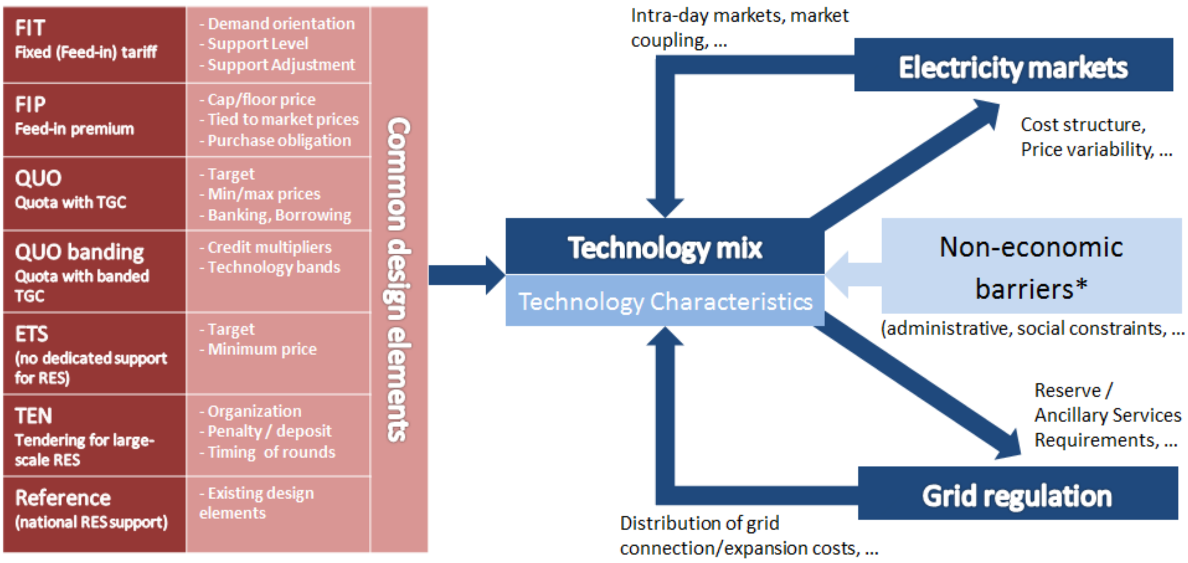


**Figure 8 Methodology for the assessment of RES policy pathways with regard to their interaction with electricity markets and grids**

Note: * Excluding constraints concerning electricity markets and grids

### *Interim findings*

In order to provide the adequate background for this analysis, we have conducted an intensive review of the literature which deals with the study of the operational and economic impacts of intermittent generation, showing the multiple challenges that most power systems will have to face in the future. There is overwhelming evidence that system operation practices and power sector regulation will have to adopt innovative approaches.

So far, we have laid the basis of the work to be faced in the next step of the work package, testing the different regulatory design alternatives for wholesale markets and grids in the presence of large amounts of RES-E.

The actual development indicates that renewable generation, especially wind and solar power, already has an increasing impact on today's system operation and grid regulation. Therefore the right steps have to be implemented now if we are to avoid an inefficient and less reliable power system when the contribution of wind and solar increases further in the future. The identification of the right steps is expected to be the major outcome of the work package at the end of the project.

## 4.4 Synopsis - Integrative policy assessment and strategic aspects (work package 6)

*The core objective of work package 6, "Synopsis – Integrative policy assessment and strategic aspects", is to perform an integrative evaluation of the policy proposals for a harmonisation of RES(-E) support in Europe as outlined during the inception phase and analysed in the thematic work packages 3 to 5. Additionally, this work package also* *covers aspects that have not been dealt with in the previous thematic tasks but that need to be taken into consideration: i.e. an evaluation of the policy design from a theoretical and a practical perspective, and an analysis of the compatibility with European policy strategies and other issues.*

*As a first outcome, the report D6.1a "Contextualising the debate on harmonising RES-E support in Europe" (Gephart* et al*. (2012)), available for download at [www.res-policy-beyond2020.eu](http://www.res-policy-beyond2020.eu), offers a brief pre-assessment of potential harmonisation pathways for RES-E support schemes by contextualising this debate in the wider EU integration process and the political and academic debate on harmonisation.*

## Objectives and tasks

The core objective of this work package is to perform an integrative evaluation of the policy proposals for a harmonisation of RES(-E) support in Europe, as outlined during the inception phase and analysed with thematic foci in the previously discussed work packages 3, 4 and 5.

Additionally, this work package is dedicated to analysing specific issues that have not been dealt with in the thematic work packages. These aspects include:

- the evaluation of the policy design from a theoretical and a practical perspective; and
- the analysis of the compatibility with European policy strategies and other issues.

Finally, all the individual aspects analysed separately in the thematic work packages will be brought together in order to provide an overall picture of the suggested policy proposals and their potential benefits and drawbacks. Moreover, we rely on part of the analysis realised in work package 7 related to the aspect of how a transition to the policy proposals could be achieved.

The integration of the relevant aspects identified is based on the concept of multi-criteria decision analysis (MCDA), which allows taking into account the preferences of decision-makers. In this regard, the consortium will review work realised previously in the field of multi-criteria assessment of energy technologies (e.g. MCDA-RES, NEEDS). Furthermore, the work package leader draws on their own experiences with national projects in the field of multi-criteria assessment (e.g. the German project "Multidimensional Technology Assessment", on which see Bartels *et al*. (2008); see also Oberschmidt and Klobasa (2008)). Expert judgements derived through stakeholder consultations will provide a crucial input for the MCDA. A new multi-criteria assessment tool will be developed for evaluating policy proposals based on varying criteria weights, including a detailed sensitivity analysis. This tool will be adapted to the specific requirements of policy-makers as far as possible. The results from this work package will serve as valuable inputs for the final revision of the assessed policy proposals at the end of the overall project.

## Contextualising the debate on harmonising RES-E support in Europe

The multi-criteria analysis that will be conducted within this work package - based on the input of different stakeholders, qualitative assessments and quantitative modelling - will provide an in-depth assessment of harmonisation pathways, using the criteria developed during the inception phase of this project. The aim of this pre-assessment is to provide a preliminary qualitative analysis of the feasibility of different harmonisation pathways. We do this by contextualising in detail the harmonisation pathways presented in the beyond*2020* project within the trajectory of "harmonisation" in EU integration history and, more specifically, in the political and academic debate on harmonised support schemes for renewable electricity. Based on the past and recent discussion, we seek to identify the main topics, challenges and possibilities that might arise across different levels of harmonisation and across different policy pathways: the project analyses the combination of 'minimum', 'medium' and 'full' harmonisation and different support instruments (FIT, FIP, Quota /w banding, without banding, ETS, tender schemes). We conclude by recommending a combined approach of bottom-up and top-down processes that is functional as well as politically and legally feasible, while still pursuing the goal of achieving an internal market for (renewable) electricity in the long term.

We acknowledge that this analysis is based on past processes and debates, and therefore inherits several uncertainties. Several market conditions (such as the electricity market framework) might change beyond 2020, thereby influencing some of the arguments made in the political and academic debate.

A detailed summary of the analysis:

**A brief recap of European integration and related harmonisation of policy fields**

- The creation of a common market has been an overarching goal of the European Union since its beginnings (Treaty of Rome, etc.). However, the process from national markets to a single market has not been linear (neither functionally nor geographically). It has always been adapted to the specific circumstances of the given point in time, of a policy field and in many cases to the preferences of certain Member States (MSs).
- Policy convergence in different policy fields has been promoted via various mechanisms and processes, of which harmonisation (the "Community method") is the most comprehensive. Geographically limited harmonisation (such as the EU-Opt out and enhanced cooperation) has helped to overcome stalemates in some policy areas.
- Where harmonisation was neither functional nor politically feasible (or both), other approaches leading to convergence have been applied, such as intergovernmental cooperation, the Open Method of Coordination, EU-opt-outs, and enhanced cooperation. They are less effective in the attempt to reach policy convergence and thus market compatibility, but they allow for greater flexibility.

**A brief recap of the debate on harmonisation in an EU-wide RES support**

- Embedded into this wider context, there has been a controversial debate on harmonisation of RES-E support schemes vs. the principle of subsidiarity.
- While the European Commission has naturally acted as a driver of harmonisation, it has in recent years promoted harmonisation only as a mid- to long-term objective, and increasingly focused on actions that facilitate improved coordination, cooperation and emerging best practices.

**Major arguments in favour of and against harmonisation**

Political and other stakeholders have put forward several interlinked arguments that support the harmonisation of support schemes and the extension of the internal market to RES-E:

- The internal market and the objective of its extension is a fundamental part of the '*Acquis Communautaire*', and it is the EU's goal to work towards its completion. It is therefore a logical step forward to create an internal market for energy, including renewable energy. Deviations from this overarching goal could pose not only economic, but possibly also legal challenges.
- The creation of the internal market generally facilitates cost savings in various ways, which to a large extent also holds true for renewable energy. The following arguments are often used:
    - the internal market leads to an optimized allocation of resources: that is, electricity would be produced at the most optimal places with, e.g., highest solar irradiation or wind speeds. This in turn results in cost savings;
    - an internal market leads to more competition and innovation;
    - a larger market with converged regulations reduces transaction costs for investors in renewable energy and leads to economies of scale, triggering additional investments in renewable energy.

- Harmonised European support schemes and/or targets are more effective and easier to enforce, at least compared to national support schemes of countries lagging behind.

Others have either criticised these assumptions or they have pointed to challenges for and limits to realising an internal market for renewable energy:

- Uniform support payments across Europe could lead to higher rents for those producers which make use of least-cost technologies and sites. This could lead to a substantial increase in target achievement related costs for society (taxpayers or consumers).
- Each MS has different geographical, legal, political, and market conditions in which renewable energy support schemes operate. These contextual conditions would either need to be harmonised (which is only possible to some extent) or the remaining differences would need to be sufficiently reflected in a harmonised support scheme. A lack of context-specificity could decrease the effectiveness and efficiency of support, which is the opposite of what is aimed for in harmonisation (and thus the internal market).
- In order to obtain public acceptance in MSs for a harmonised support scheme, politically accepted distribution of costs and benefits would have to be achieved, which is likely to pose a significant challenge, given the large number of MSs and their national preferences. Neglecting domestic costs and benefits could lead to (local) opposition and loss of public acceptance.
- Domestic energy policy and different policy interests make harmonisation difficult to achieve. In line with the principle of subsidiarity, MSs have developed their own tailor-made energy policies, which include different goals and ambitions: that is, different preferences. At the moment, not all MSs share a comparable ambition towards renewable energy, and they are not willing to transfer the required competences to a European level.

**Current state of coordination and harmonisation**

- While the debate is partially structured according to an analytical dichotomy between national and harmonised support schemes, this viewpoint needs to be replaced with a more differentiated approach.
- The current RES Directive 2009/28/EC already contains several requirements that can be interpreted as steps towards harmonisation of RES market conditions, such as the requirement to introduce priority or guaranteed grid access and priority dispatch, defined calculation methods, minimum design criteria for Guarantees of Origin, etc. Moreover, the Directive mandates Action Plans and reporting, which in turn enable processes of knowledge exchange and policy competition – characteristics that are similar to those of the Open Method of Coordination.
- Moreover, MSs are partially coordinating their policies in different fora and, in combination with policy competition and the academic community, several best practices have emerged against which MSs are increasingly measured.

**Pre-assessment of beyond*2020* policy pathways**

The pathways developed in the beyond*2020* project as shown in Table 5 reflect the different harmonisation approaches discussed in the past.[17] Accordingly, many of the arguments summarised above can be applied to these pathways.

- Several issues arise that are related to the potential instrument chosen for a harmonised support scheme.
    - Quota without banding and ETS would prefer static cost-efficiency (least-cost technology approach) over dynamic efficiency and technology development. From the

[17] An exception to this is the reference case that includes also an optional minimum harmonisation. Note further that this reference track is excluded from the subsequent pre-assessment.

current perspective, this would probably prevent the further development of less mature technologies, like offshore wind and more expensive biomass technologies. ETS could even threaten further RES development as a whole. Furthermore, uniform support would either lead to very limited RES deployment or to substantial rents for producers of least-cost RES-E. Given the strong interest in certain, less mature technologies and the sensitivity to support costs, both pathways appear rather dysfunctional from the current perspective.

    - Given deeply embedded differences between MSs regarding strict market orientation vs. more State interventionist approaches, a harmonisation of either FIT or quota schemes seems politically difficult to achieve, also beyond 2020. A FIP and/or a combination of instruments for small- and large-scale RES might be considered the most feasible option, since they are accepted and applied in both types of countries.

- Other issues are independent of the instrument, but relate to the degree of harmonisation.
    - Medium and Full harmonisation would either abolish additional RES policy efforts by MSs (full harmonisation) or would put them under pressure (medium harmonisation), because the internal market would not allow (or at least would require strong justification) for market distortions through additional explicit RES support at MS level.
    - Medium and full harmonisation would create substantial challenges regarding a fair and, more importantly, politically acceptable distribution of costs and benefits. In particular, the effect on indirect costs and benefits (such as local added value, but also grid integration costs, etc.) would be likely to generate opposition from MSs.
    - Against this background, we argue that both pathways - Medium and Full harmonisation - seem politically challenging and partially dysfunctional with regard to the envisaged increase in RES-E deployment.

- The choice and harmonisation level of a support instrument by itself will not yet determine the effectiveness and efficiency of RES-E support. Several best practices and design criteria have emerged during recent years and these would have to be taken into account, regardless of the support instrument or the level of harmonisation.

**Conclusion and ways forward**

- There has been a complex interplay of coordination, cooperation and selective harmonisation, which we argue is the most functional and politically feasible way forward, also beyond 2020.
- The continuation of a mixture of top-down and bottom-up processes would focus on harmonised minimum design criteria (top-down) and intensified coordination and cooperation between MSs (bottom-up). This option would foster policy convergence and market integration, while respecting the MSs' different preferences, which should increase the political and legal feasibility, and (thus) public acceptance, of such an approach.

## 4.5 Consolidation – Policy design and recommendations (work package 7)

*Building on the outcomes of the impact assessment the goal of work package 7 is to undertake a consolidation and refinement of the outcomes of the detailed impact assessment of the assessed policy paths form a harmonisation of RES(-E) support.*

*This report represents the first outcome of this work package, summarising the work done up to the mid-term of the project and offering an outlook on forthcoming working steps. Hardcopies of this report can be ordered via email* *(beyond2020@eeg.tuwien.ac.at) and is available for download at www.res-policy-beyond2020.eu.*

### Objectives and tasks

The core objective of this work package is to undertake a consolidation and refinement of the outcomes of the detailed impact assessment of the assessed policy paths form a harmonisation of RES(-E) support. The final outcome will be a finely-tailored policy package, offering a concise representation of key outcomes as well as a detailed comparison of the pros and cons of each policy pathway from the various perspectives as researched in the thematic / synoptic work packages 3 to 6. This will include detailed roadmaps for each assessed policy pathway, including guidelines for the detailed design suitable for practical policy implementation and recommendations on the steps to be taken in the transitional phase. Moreover, an outline of a legal draft for the implementation of key provisions of two recommended policy pathways for a harmonisation of RES(-E) support will be derived within this work package. In this context, in line with the European Commission's principles of good governance, it is aimed to offer a menu of feasible and recommended options instead of prioritising purely one single implementation.

The work within this work package comprises analytical elements and intensive communication due to strong interactions with other work packages, as well as a significant amount of reporting tasks. Five subtasks can be identified from a conceptual viewpoint:

- integrative guidance on policy design;
- structuring of the transition from national to European-wide harmonised support schemes;
- development of roadmaps for practical implementation of each assessed policy pathway;
- development of juridical implementation concepts for selected policy paths;
- consolidation of key findings and recommendations.

## 4.6 Communication (work package 8)

*This project requires an organized communication and dissemination strategy and programme in order to guarantee useful and meaningful interactions with stakeholders, as well as to serve as a dissemination platform for project results. This is the main objective of work package 8.*

*Stakeholder interactions are achieved through the international mid-term conference, two regional workshops and bilateral consultations. As a complement to this, the project website serves as an information exchange and communication platform. Special regional dissemination workshops are designed to gather an important number of stakeholders in key geographical regions across Europe in order to discuss key outcomes and to ensure the adequate consideration of regional specifics.*

*The first large-scale event – the international mid-term conference – took place on 10 October 2012 in Brussels. Major results achieved by the middle of the project were presented at this event and discussed with a broad set of stakeholders. The agenda, presentations and a brief summary of this event are available at the project's web page www.res-policy-beyond2020.eu.*

### Objectives and tasks

To support the European vision of a joint future RES policy framework in the mid- to long-term and improving policy design, not only is a detailed impact assessment of the policy instruments needed, but also an intense exchange of experiences between EU, national, local and regional policy-makers, in order to discuss and evaluate the possible implementation effects from successful options. During the duration of the beyond*2020* project, this work package performs a connecting communication function in the project and assures a strong interaction between different work packages, partners and external stakeholders.

For this purpose, intense and interactive communication and dissemination activities were launched directly after the start of the project, ultimately involving - in addition to bilateral meetings with stakeholders - the organisation and hosting of three regional dissemination workshops, two topical workshops, one international mid-term conference and one international final conference at the end of the project. The interaction which is crucial to the project workshops and conferences must go in both directions, by presenting and discussing achieved project results as well as receiving valuable input for further analytical work within the project.

## *Past events*

### Mid-term conference

A major event for the beyond*2020* project was the *International Mid-Term Conference*, which took place on 10 October 2012 in Brussels, Belgium. This conference attracted the participation of a broad set of stakeholders from EU institutions, national governments and policy-makers, energy companies and producer associations from the RES Industry, as well as consultants and research institutions, all of them being key target audiences for the discussion and dissemination of the interim findings reached during the first half of the project.

Major results presented at the event correspond to the identified pathways for harmonisation of RES support beyond 2020. These include a first pre-assessment of various harmonization concepts from a techno-economic and conceptual point of view, discussing their policy practicability, complemented by an analysis of RES policy options from the legal perspective, focusing on potential areas of difficulty under EU Law. Furthermore, as presented and discussed at the conference, the ongoing assessment of proposed RES policy pathways within beyond*2020* is multi-faceted and considers a comprehensive cost-benefit analysis of policy options as well as the interactions between RES-policies and electricity markets, examining several interacting aspects in grid-related issues, technologies and electricity prices.

The active participation of the European Commission in the event provided a comprehensive overview of the most important current issues at the European level. Expected developments after 2020 on RES-Electricity support mechanisms and policies, the implications and possibilities of harmonisation, as well as other ways of convergence, also including a stronger interaction between climate policies and renewable energy policies, were presented and intensively discussed. It emerged that it was still premature to identify preferred options for beyond 2020. Thus, the importance of the beyond*2020* project to analysing the effect of a broad set of policy options and in providing concrete recommendations and inputs for policy makers and other stakeholders was confirmed.

Note that the agenda, presentations and a brief summary of this event are available at the project's web page www.res-policy-beyond2020.eu.

### Topical workshops on RES policy design and on interactions with electricity markets

The mid-term conference was accompanied by two topical workshops in order to deepen the discussion on strategic aspects of long-term RES policy design, and on the impact of RES-E and the proposed pathways in electricity markets. These are major tasks for the project that benefit strongly from interaction with stakeholders and experts, such as energy agencies, transmission and distribution system operators, electricity generators, policy-makers and researchers.

- The first topical workshop took place on 19 September 2012 in Brussels. This workshop was dedicated to discussing **strategic aspects of long-term RES policy design**, as well as to gaining further insights on stakeholder perceptions.

The Brussels workshop was designed to be an open discussion forum for a selected target audience: i.e. EU and national RES policy-makers and key stakeholders. This allowed interactive and focused discussions on design elements of harmonized instruments, also serving as input into the overall multi-criteria analysis and subsequent policy assessments in accordance with EU Law.

The session was dedicated to discussing the possible policy criteria and presenting possible harmonization pathways, followed by an introduction to the Multi-Criteria assessment. The various design elements for harmonization instruments were presented as a starting point for discussion.

- The second topical workshop was held on 24 October 2012 in Madrid. This workshop was dedicated to discussing the **trade-offs and linkages of electricity markets and RES policies** in further detail.

  The aim of this workshop was to reflect on key draft findings on the possible interactions between RES support schemes and the general electricity markets, including the overarching question of how electricity markets need to be designed in the future to cope well with an increasing share of fluctuating RES.

  The various pathways for harmonization were presented as starting point for discussion, followed by key findings on the interaction of RES-Policies and electricity markets, highlighting assessment criteria and initial results.

### *Forthcoming events*

Closer to the end of the project, in the second half of 2013, a series of three regional dissemination workshops is planned.

In October 2013, the international final conference is scheduled in Brussels in order to present and discuss key outcomes and recommendations for support mechanisms of renewable electricity generation beyond 2020.

Please note that information on past events and latest news on forthcoming workshops are available at www.res-policy-beyond2020.eu.

# 5 Summary of key interim findings & next steps

This report concludes with a summary of key interim findings and a brief outlook on next steps, discussed in topical order.

- *Policy pathways for a harmonisation of RES(-E) support and assessment criteria*
  Many alternatives for harmonisation of RES(-E) support schemes exist, which can be assessed by reference to quite different criteria. The two-dimensional matrix provided during the inception phase of this project allows the structuring of the discussion on feasible alternatives for policy pathways, distinguishing between the policy instruments and relevant design elements as well as between different degrees of harmonization (i.e. from minimum or soft up to full harmonisation). These pathways will be assessed according to the policy-relevant evaluation criteria (including effectiveness, cost-effectiveness, dynamic efficiency, environmental and economic effects, socio-political and legal feasibility) developed in the course of this project.

- *Potential areas of difficulty under EU Law*
  The first assessment of the legal feasibility of different harmonization approaches has made the following interim findings: beyond the general inventory of key Treaty and secondary legislative provisions, one particularly challenging question concerns the legal basis for EU-level action in the energy field. Article 194 TFEU was introduced as a result of the Treaty of Lisbon and, as a new provision with rather vague wording, its precise implications are not yet completely clear. In particular, the caveat in the second sentence of Article 194(2) clearly introduces some limits upon the EU's competence. However, it might be interpreted as introducing an area of exclusive Member State competence (and thus no EU competence) on such matters (although this is considered unlikely); or it might amount to a requirement of unanimous voting in the Council on any such EU measure (perhaps the easiest practical solution); or it could operate as a form of Treaty-level derogation for a Member State from any EU measures adopted under Article 194.

- *Assessment of harmonization concepts and their practicability - first results*
  The debate on harmonization is contextualized within the wider integration process of the EU, and the pros and cons of harmonization of RES-E support schemes are discussed. As a conclusion, an interplay between coordination, cooperation (bottom-up, between Member States) and selective harmonization (top-down, e.g. minimum design criteria, EU-opt out or advanced cooperation) is determined to be the most functional and feasible pathway to support policy convergence and subsequent market integration, while taking into account a wide variety of differences between Member States at the same time.

- *European RES policy beyond 2020 from an energy company/utility perspective*
  The mobilization of investors is crucial to achieving European goals in the deployment of renewable energies. Important requirements for attracting investors are legal certainty and sound legal protection. Furthermore, public acceptance and engaging citizens in the decision-making process are crucial, as are transparency and efficiency in the approval process. Incentives for infrastructural measures, such as grid extensions and storage facilities, are required to provide energy security and grid stability. Regional and technological differentiation of support is a measure to mitigate both the regional and technological concentration of RES installations.

- ***Cost-benefit analysis, initial results of the quantitative assessment of RES policy pathways beyond 2020***

  The current RES Directive (Directive 2009/28/EC) lays the basis for the EU's RES policy framework until 2020, but a strategy and clear commitment to RES beyond 2020 is needed (if RES is to deliver what is expected). The initial results of the policy assessment indicate that cooperation and coordination among Member States appears beneficial and, indeed, is required to tackle current problems in RES markets. Thus, both of these policy options would also appear to be fruitful for the period beyond 2020. By contrast, "simplistic approaches" to RES policy harmonization (e.g. via a uniform RES certificate trading) cannot be recommended in either the short or the long term.

- ***Interactions between RES-Policies and Electricity Markets***

  The objective of this first stage of assessing trade-offs has been to review existing studies of the interactions between RES-E and electricity markets, grid policies and regulatory designs, in order to inform the assessment of the impacts of different RES-E policy pathways. The deep analysis of the literature, as well as the work developed by the team, shows that regulatory design will be crucial for both the future deployment of RES-E and the overall efficiency of wholesale markets and grids. Moreover, it appears likely that impacts and interactions depend more on the detailed design of certain instruments than on the general policy instruments themselves.

- ***An integrated RES policy assessment to conclude the evaluation process of policy pathways in the forthcoming period***

  A multi-criteria analysis will be carried out throughout the second half of this project, building on the completion of other topical assessments (i.e. cost-benefit analysis, legal evaluation, analysis of market interactions). This shall serve to provide a ranking of policy pathways depending upon how highly each alternative scores in each criterion, weighted by the decision-makers. The PROMETHEE method will be used for this analysis. The weighting vectors of various decision-makers are needed as an input to the model. To obtain an impression of the spread of opinions, a stakeholder consultation is currently being conducted: e.g. at beyond*2020* workshops and conferences, participants were asked to fill in a criteria weighting questionnaire.

- ***A finely-tailored policy package at the end of this project***

  The final outcome of beyond*2020* will be a finely-tailored policy package, offering a concise representation of key outcomes and a detailed comparison of the pros and cons of each policy pathway (including quantitative and qualitative results). Moreover, roadmaps for practical implementation of each of the assessed policy pathways shall be elaborated and an outline of a legal draft for the implementation of key provisions of two recommended policy pathways provided. Note that drafts of these key products will be presented at forthcoming dissemination events, to allow for critical reflection on their content throughout the second of half of 2013.

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*Project web:* [www.res-policy-beyond2020.eu](http://www.res-policy-beyond2020.eu)

*For further information on the topics addressed briefly within this report we refer to the following* beyond*2020 publications:*

| *Addressed Topic* | *Corresponding* beyond*2020 publication* |
|---|---|
| RES policy pathways beyond 2020: elaboration of feasible pathways for a possible harmonisation of RES(-E) support in Europe beyond 2020 | del Rio *et al* (2012a): "Key policy approaches for a harmonisation of RES(-E) support in Europe - Main options and design elements" |
| Policy evaluation criteria: identification and definition of evaluation criteria for the subsequent impact assessment of feasible policy approaches for a harmonisation of RES(-E) support in Europe from a theoretical viewpoint, discussing and contrasting economic theory and practical applicability. | del Rio *et al* (2012b): "Assessment criteria for identifying the main alternatives - Advantages and drawbacks, synergies and conflicts" |
| Legal aspects: a general overview of all the Articles and provision in EU primary and secondary law which may have an impact on the EU's legislative competence in the field of RES support. | Fouquet *et al* (2012): "Potential areas of conflict of a harmonised RES support scheme with European Union Law" |
| Cost- benefit assessment: initial results of a quantitative model-based analysis of future RES policies beyond 2020 | Resch *et al* (2012): "Cost-benefit analysis – initial results of the quantitative assessment of RES policy pathways beyond 2020" *(forthcoming (end of 2012))* |
| Trade-offs with electricity markets: a literature review about the interactions between RES-E support instruments and electricity markets | Batlle *et al* (2012): "Review report on interactions between RES-E support instruments and electricity markets" |
| Strategic aspects of RES policy support: a brief pre-assessment of potential harmonisation pathways for RES-E support schemes by contextualising this debate in the wider EU integration process and the political and academic debate on harmonisation. | Gephart *et al* (2012): "Contextualising the debate on harmonising RES-E support in Europe - A brief pre-assessment of potential harmonisation pathways" |

*This report*
*concludes the inception phase of the* beyond*2020* *project, summarising the work done up to the mid-term of the project and offering a brief outlook on forthcoming working steps.*