Co-funded by the Intelligent Energy Europe Programme of the European Union

DIA-CORE POLICY BRIEF

Renewables in the EU: Policy performance, drivers and barriers

Inga Boie, Anne Held, Mario Ragwitz and Fabio Genoese[1]*

16 June 2014

Key Messages and Recommendations

- ✓ A clear and reliable policy framework is essential for the stable and sustainable diffusion of all renewable energy technologies. Sudden changes, including retroactive changes, should thus be avoided.
- ✓ Instruments that lead to strong market growth are also often economically efficient. Conversely, overcompensation does not necessarily result in strong market growth.
- ✓ Technology-specific support should be given in order to avoid windfall profits and to exploit the cost-reduction potential of current, less cost-efficient technologies.
- ✓ Predictable, transparent and continuous adaptations of support levels for dynamic technologies, such as solar PV, are required to limit policy support costs and to adapt to changing framework conditions. At the same time, long-term commitment, early communication of changes, including public participation in the design of the support scheme, helps to maintain a sound investment climate.

Launched in April 2013, DIA-CORE is carried out under the Intelligent Energy Europe programme. Its main objective is to ensure a continuous assessment of the existing policy mechanisms and to establish a fruitful stakeholder dialogue on future policy needs for renewable electricity (RES-E), heating & cooling (RES-H) and transport (RES-T). Thus, DIA-CORE seeks to facilitate convergence in RES support across the EU and to enhance investments, cooperation and coordination.

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* Inga Boie, Anne Held and Mario Ragwitz are researchers at the Fraunhofer Institute for Systems and Innovations Research (ISI), Karlsruhe. Fabio Genoese is Research Fellow at the Centre for European Policy Studies, Brussels.

1 Introduction

Discussions on the economic efficiency of support policies for the use of renewable energy sources (RES) have gained momentum in recent months and will continue to be on the political agenda, given the ongoing adoption process of the 2030 EU Climate and Energy package. Although various EU member states have different starting positions and different deployment targets for renewables (European Commission, 2010), implementing both efficient and effective support policies should be a major objective of policymakers across the EU.

In order to facilitate efficient and effective policy design, it is crucial to acquire a more comprehensive understanding of the technology costs, barriers and drivers framing the diffusion of renewables (Lüthi & Wüstenhagen 2012). Using this knowledge, it will be easier to design policy instruments that avoid overcompensation on the one hand but ensure a high project realisation rate on the other.

In the context of the research project called "DIA-CORE", we are conducting a broad, quantitative assessment of the relevance of factors framing the diffusion of renewable energy technologies in the EU. The analysis covers both economic and non-economic factors and places particular emphasis on the relationship between them.

The assessment of framework factors (determinants), which may be barriers or drivers, draws upon an EU-wide survey we conducted of stakeholders, whereas the policy performance indicators are based on an *ex-post* evaluation of the development of support payments, technology costs and the actual deployment of renewables from 2007 to 2014 in all 28 EU member states.

In this Policy Brief, we report the initial findings of the survey based on the responses that have been received as of May 2014. We also present the initial results of the assessment of policy performance indicators.

2 Key findings of the survey

Overall, we analysed the responses to the questionnaire assessing the relevance of major determinants for RES diffusion from more than 180 actors from 24 EU countries (plus from actors that described themselves as being active EU-wide and several experts from non-EU countries or with worldwide activities). All major RES technologies (wind, solar photovoltaics, biomass, geothermal, hydro, concentrated solar & solar thermal) are represented among the respondents, especially wind and solar photovoltaics (PV).

Across all stakeholder groups and renewable energy (RE) technologies, the **political and economic framework** is considered as the **most important factor**, with a median relevance of 9 out of 10, which represents the maximum possible number of attributable points.[2] Other determinants such as the market structure, grid regulation and administrative processes are considered as less relevant than the economic framework scoring a median value of 7 to 8. This result underpins the importance of a clear and reliable policy framework in order to achieve a stable and sustained diffusion of renewable energy technologies.

Detailed results are shown in Figure 1. The grey boxes in the graph illustrate the range of points attributed by at least 50% of the stakeholders who participated in the survey, whereas the black lines indicate the full range of attributed points. This provides further clarity on the relevance of the individual factors. The results refer to all renewable energy technologies in the electricity sector.

The graph illustrates that 10 points ("extremely relevant") have been attributed most frequently to the determinant "political & economic framework" and that half of the stakeholders attributed at least 9 points to this factor. Moreover, this determinant shows the lowest spread between minimum and maximum attributed relevance score (indicated by the black lines).

The relevance of the other factors is lower. Most notably, some very low relevance scores of up to 1 point have been attributed to these factors, increasing the variance in scores. Here, particularly technology- or actor-specific requirements may lead to a stronger segmentation of results. However, the relevance of these factors can still be considered as high: Half of the respondents assigned at least 8 points to market structure and grid regulation and at least 7 points to administrative processes.

[2] A more in-depth description of the survey's methodology can be found in the Annex.

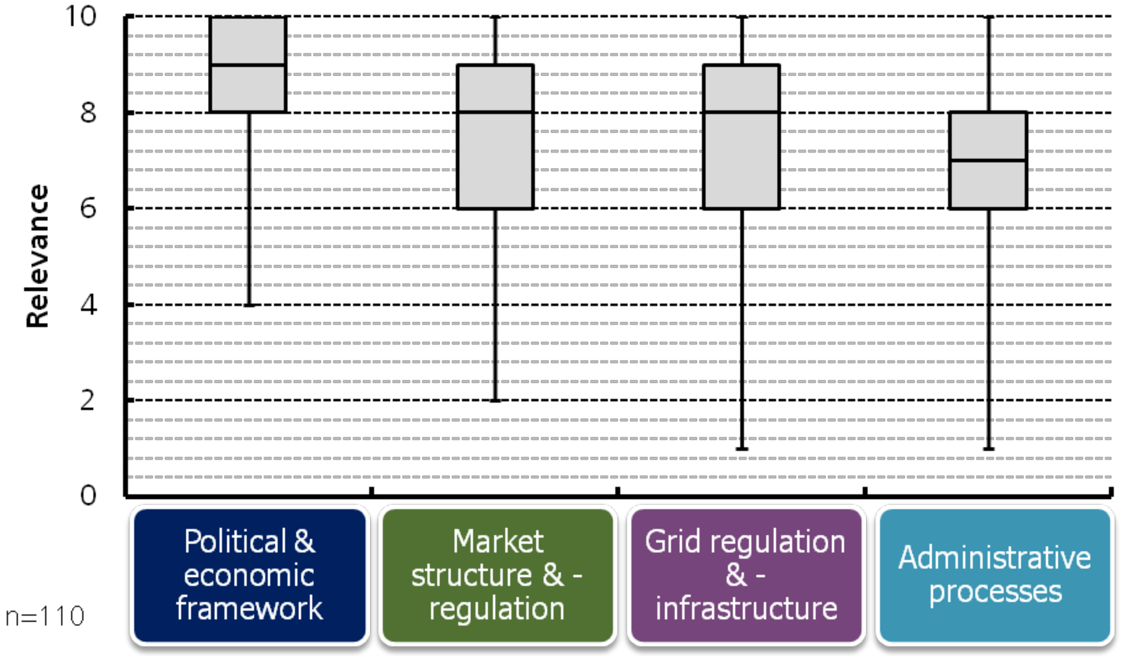


Figure 1. Relevance of the main determinants across all RE technologies

Taking a closer look at the sub-determinants of the political and economic framework reveals that the general renewable energy policy strategy and the existence of a **reliable renewable energy support scheme** are clearly considered as the **most important factor** (see Figure 2).

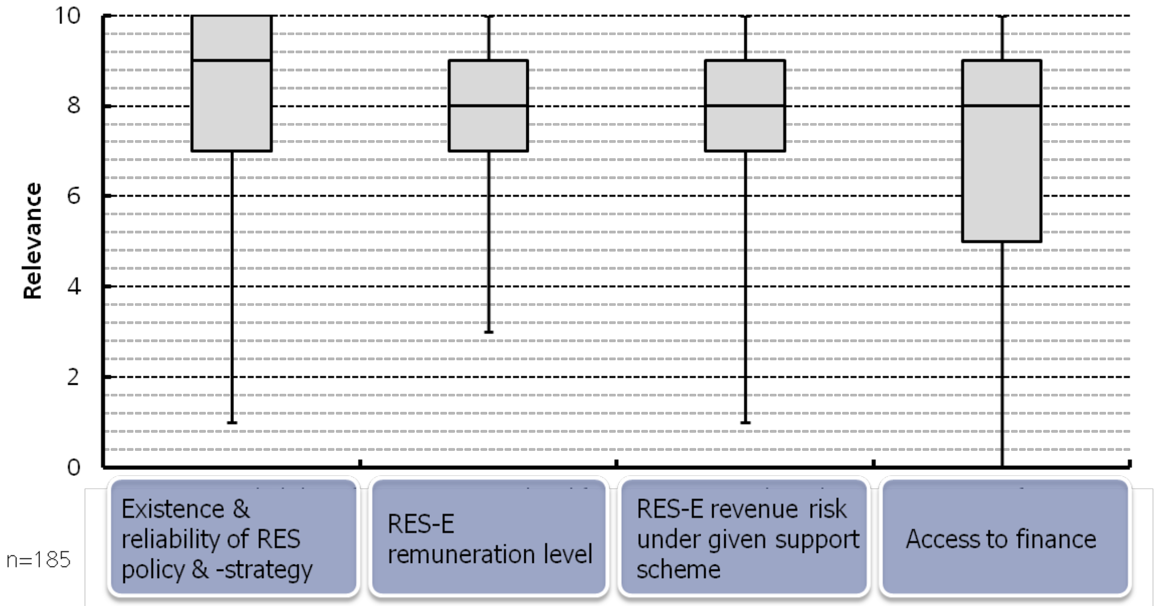


Figure 2. Relevance of the political and economic framework across all RE technologies

Interestingly, this sub-determinant is **rated even higher than the actual level of remuneration**. The revenue risk is rated similarly high but responses show a higher variety in scores. Access to finance is rated less important. Most notably, individual stakeholders even considered this factor as "not relevant at all". Generally, this factor has the largest variance in scores indicating that significant differences between actors exist.

Going a step further and comparing the scores for different RES technologies reveals a varying relevance for some framework factors.

For example, comparing wind onshore and PV shows that the differences are rather marginal concerning the political and economic framework (see Figure 3). Solar PV developers seem to put slightly less emphasis on the general RES policy strategy and support than wind developers. This might be due to the higher relevance of 'own-consumption schemes'[3] for solar PV, which leads to a certain independence from the remuneration scheme as such.

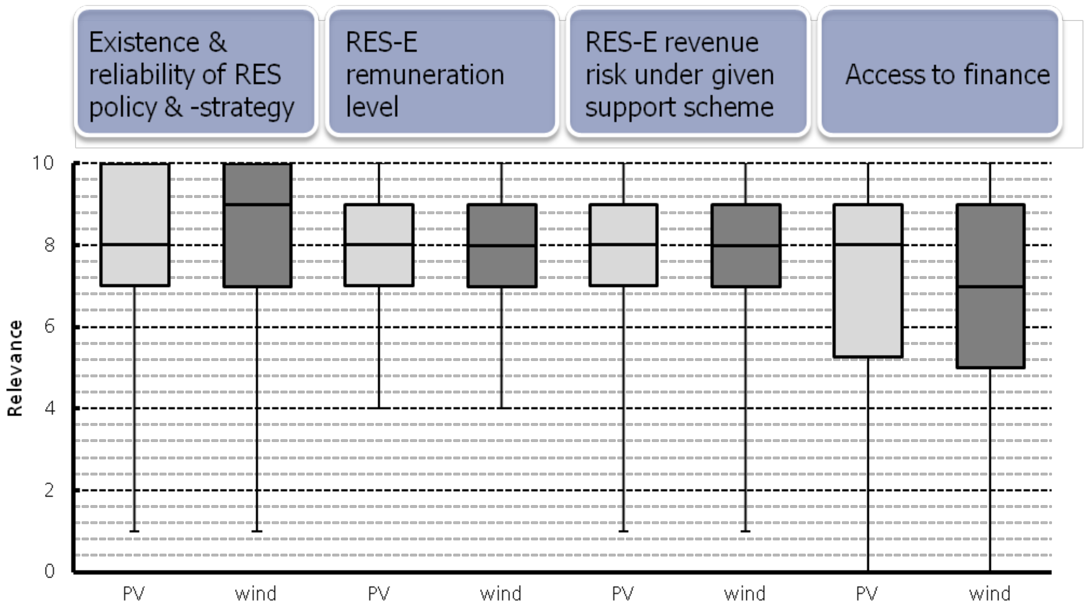


Figure 3. Relevance of political & economic framework: Comparison of wind onshore and large-scale PV

Access to finance displays a slightly higher median relevance for wind than for PV. This might be related to the usually higher capital intensity of wind projects compared to PV projects, which makes them more vulnerable to risk elements,

[3] Also known as 'net-metering'. The objective of such a scheme is to set direct or indirect incentives to consume the produced electricity directly instead of feeding it into the grid.

as well as to the fact that, according to RES investors, PV plants are financed from balance sheets more often.

However, as solar PV and wind are two similarly established technologies in terms of installed capacity, it is not surprising that their requirements with regard to the design of the economic framework are quite similar.

Regarding grid regulation and administrative processes, the scores for wind and PV show stronger deviations. For example, transparent and foreseeable grid development, as well as the duration of grid connection procedures are rated as more relevant by wind experts than by PV experts (median scores of 7 for wind and 6 for PV). The same applies to the treatment of RES-E dispatch/the possibility of uncompensated curtailment, which is more relevant for wind than for PV developers.

Also the duration of administrative procedures and the integration of RES planning in spatial and environmental planning score higher for wind than for PV, indicating that these issues should be treated with priority in order to create favourable framework conditions particularly for wind development.

It should be noted, however, that since many of the respondents are cross-cutting (i.e. are active in the development of two or more renewable energy technologies), there is an overlap between the datasets, which leads to less pronounced differences.

3 Performance of EU support policies for renewables

Policy performance can be measured by a variety of indicators, but **effectiveness** and **economic efficiency** are of particular interest. The effectiveness indicator compares the additional generation from renewable energy sources in one year with the overall realisable potential until 2030. Thus, the indicator reveals the extent to which support policies have been able to trigger deployment. The economic efficiency indicator compares the support payments to the actual generation costs.[4] Thus, it can be used to disclose the profit level of a support scheme. A high-profit level can be considered as overcompensation and therefore as economically inefficient. Instead, support payments that are moderately above generation costs are an indicator of an efficient support policy.

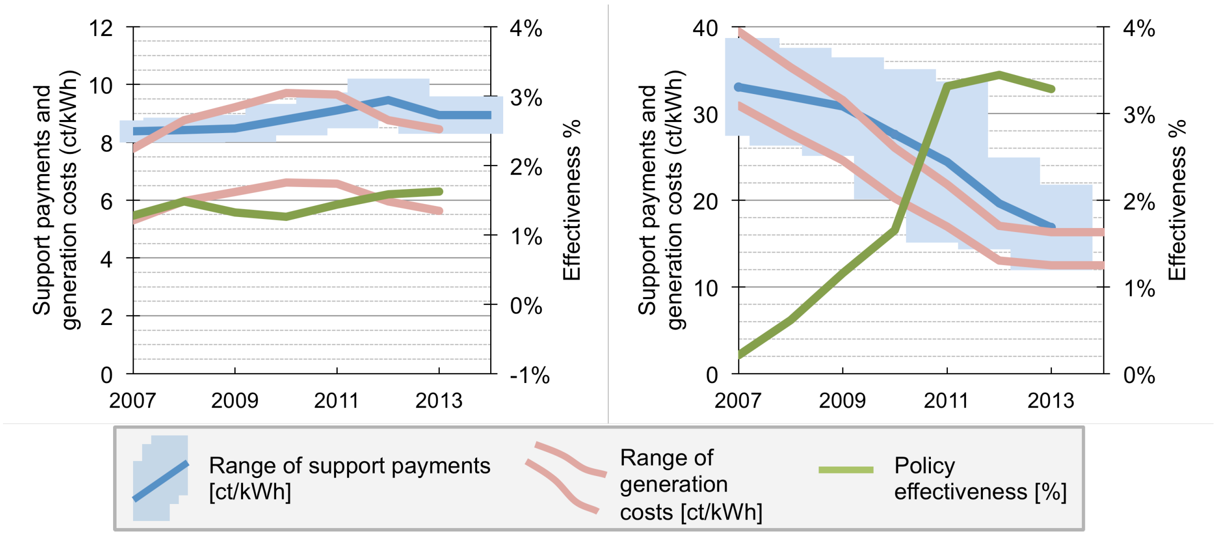
[4] More precisely, to the levelised costs of electricity (LCOE), i.e. the generation costs including the initial capital, as well as the costs of operation and maintenance.

It is worth noting that these two indicators are also regularly used by the European Commission and the International Energy Agency. See the Annex for a more in-depth description of the methodology.

This analysis evaluates the development of support payments, technology costs and the actual deployment of renewables for the period 2007 to 2014. Whilst indicators have been calculated for 28 member states and 14 technologies in the electricity, heat and transport sector, we concentrate in this report on the results for solar PV and wind onshore. The results are summarised in Figure 4.

Overall, the evaluation of EU renewables policy reveals the following findings:

- For **solar PV**, the policy effectiveness increased until 2011 and has since remained at a stable level (see Figure 44, right side).
- The trend for **economic efficiency** is less clear: technology costs have decreased significantly since 2007 (-59%). However, the adjustment of support payments was not fully synchronised with this decrease between 2010 and 2012. This changed again after 2012, suggesting an improving economic efficiency in recent years.
- For **onshore wind power**, the policy effectiveness has been rather constant over the years with a slight decrease during the economic crisis in 2009-10, which is contrary to the often-stated view that the deployment of renewables was unaffected by the economic crisis (see Figure 44, left side).
- **Technology costs** slightly increased between 2007 and 2009, primarily due to the fact that material costs were on the rise in that period (e.g. steel). Since 2010, decreasing technology costs can be observed.
- Overall, **payment levels** have been adjusted to follow the cost trend. However, falling onshore wind power costs after 2010 have not been reflected adequately in all EU member states. This suggests a period of decreasing efficiency which was, however, preceded by a period of low profit levels in 2008-09 caused by increasing material prices. A national analysis shows that e.g. Italy realised strong cuts of support payments and managed to reduce the previously high windfall profits available from the quota obligation with the introduction of an auction scheme.



(a) Onshore Wind **(b) Solar PV**

Figure 4. Annualised support payments, generation costs (left axis) in the EU28 compared to policy effectiveness (right axis)

Solar PV in Germany

The situation in Germany is of particular interest, given the massive deployment of solar PV in 2011 and 2012. In this period, roughly 15 GW of solar panels were installed in that country, corresponding to 25% of the global new installations in these years. In some cases, this drew heavy criticism, especially regarding the economic efficiency of the German support scheme.

The development of indicators is illustrated in Figure 55 and reveals the key findings outlined below:

- From 2007 to 2011, an increasing trend for the effectiveness can be observed, reaching a maximum of roughly 11% of the 2030 potential. On a European level, the effectiveness of solar PV support peaked at some 3.5% in 2012.
- Support payments were constantly adapted to reflect falling technology costs. A strong decline of solar panel prices resulted in a reduction of feed-in tariffs in 2010 and 2011. However, the level of support payments remained constant for one year in 2011.
- In December 2011, the peak of new installations was reached: 3 GW in one month. This can be understood as a 'pull-forward' effect – investors anticipated the reduction of support payments for new installations in January 2012.

- Since 2012, tariffs are adjusted every month automatically (i.e. the change does not have to be adopted by the Parliament). The absolute decrease of payments depends on whether deployment targets are met. Overachieving deployment targets leads to a stronger reduction of feed-in tariffs.
- The profit level was close to zero in 2013. This indicates a high economic efficiency.

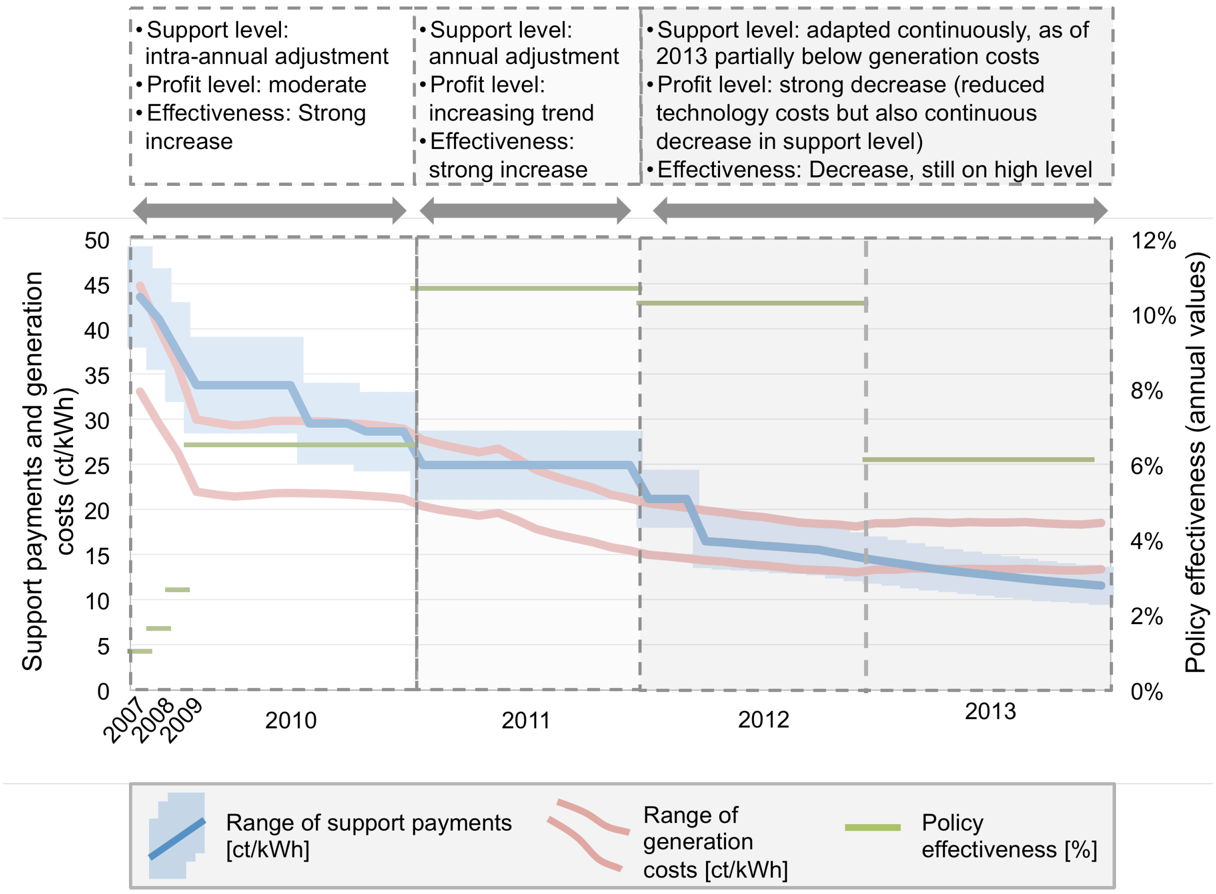


Figure 5. Evolution of support payments, generation costs and policy effectiveness for solar PV plants in Germany, 2007-13

Overall, one of the key lessons to be learned from this case study of Germany's experience with solar PV is that there is a need to constantly monitor technology costs and to frequently adapt support payments in rapid response to changes in costs. This is a solid measure to avoid overcompensation. Moreover, experience shows that automatic payment cuts based on transparent criteria are more effective than payment cuts that have to be adopted in a parliamentary process. The German example also shows that a stable and reliable support scheme ensures a high effectiveness. Conversely, high profit levels do not necessarily lead to strong market growth, as an evaluation of other EU member states shows.

This lesson is illustrated in Figure 66 for solar PV. There, the potential profit range is compared to the policy effectiveness for the year 2013. Several EU member states that applied schemes allowed for higher profit ranges than did Germany (e.g. Italy, France, Romania and Austria). However, this did not result in higher policy effectiveness, i.e. it did not produce a stronger market growth.

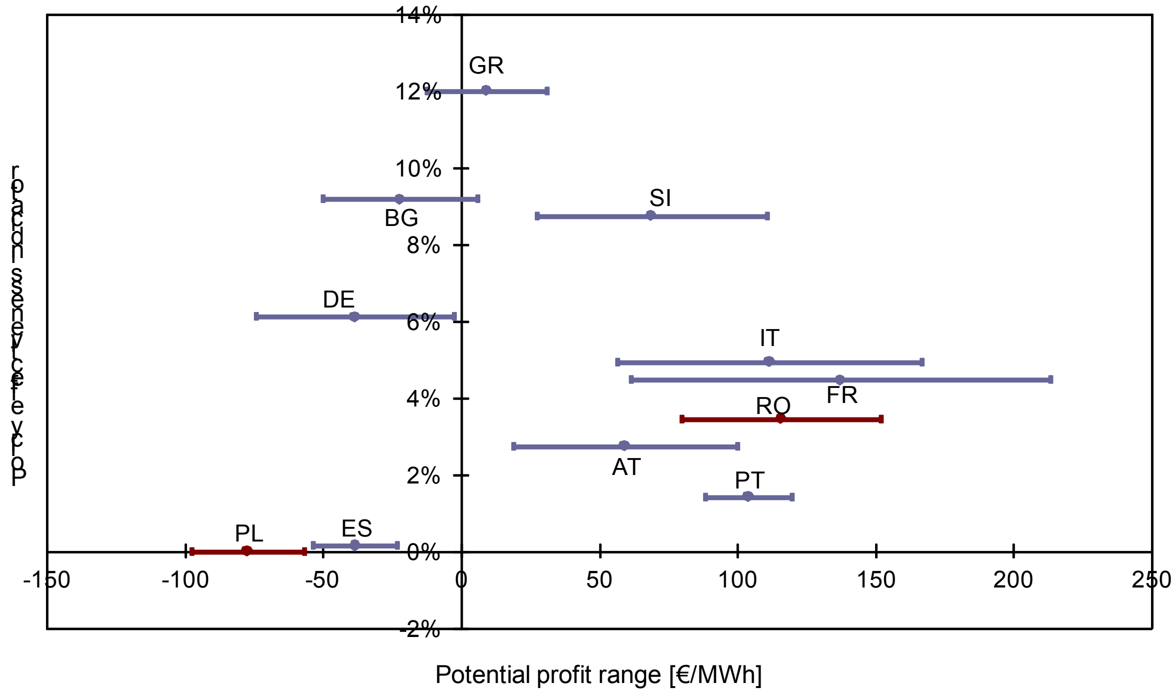


Figure 6. Policy effectiveness and potential profit range of solar PV in various EU member states in 2013

4 Conclusions

The results from our survey highlight the importance of establishing a **clear and reliable policy framework** in order to achieve a stable and sustained diffusion of renewable energy technologies. Stability and reliability of the policy framework are **even rated as more important than the actual payment level** for renewables. Thus, sudden policy changes and especially retroactive changes should be avoided in all cases.

The assessment of policy performance indicators underlines that **detailed knowledge of generation costs is required** when designing renewable support schemes. Profit levels should be kept at a moderate level to avoid windfall profits and overcompensation. With cost-potential curves still being steep, support for renewables should be implemented in a technology-specific format.

Interestingly, there is empirical evidence that **high profit levels alone do not result in strong market growth**. For a policy to be effective, it is crucial to ensure a high stability of policy and a sound investment climate. In general, **non-economic barriers for policy design must also be taken into account**.

A long-term commitment is required to ensure sustainable diffusion. While it is necessary to leave room for flexible adaptations given the fact that framework conditions can change, it is crucial to **communicate** any planned **changes** in the support policy **at an early stage and in a transparent way** and to include the general public in this process. As shown by the German example for PV development, a t**ransparent** and **continuous adaptation** of support payments **does not necessarily worsen the investment climate**.

In order to exercise more **control** over the **total support costs**, **price elements** can also be **determined in a competitive bidding process**. Another option is to combine tariffs with the imposition of caps on quantities.

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Annex: Methodology

Survey

The first part of this assessment draws upon on a questionnaire-based stakeholder consultation via an online platform and a mail survey. Thereby, stakeholders are requested to assign scores ranging from 0 (not relevant at all) to 10 (extremely relevant) to the main determinants and corresponding sub-determinants influencing the diffusion of renewable energy (RE) technologies. Similar multi-criteria ranking and evaluation methods are increasingly applied to the assessment of investment decisions in RE technologies (Taha & Daim, 2013).

Overall, the survey has recorded more than 190 responses across the EU, as of May 2014. The group of respondents is diverse and represents different types of institutions, among which RES project developers clearly constitute the majority. Industry associations and energy utilities represent the second-largest group, although the utilities often have a double function as project developers. It is worth noting that the process of data-gathering is still ongoing and that the results are being updated continuously.[5]

There are four main determinants:

- Political & economic framework
- Market structure and regulation
- Grid regulation & infrastructure
- Administrative processes

For each of the four determinants, there are additional sub-determinants to provide further clarity (see Figure below).

[5] Questionnaires can be filled in here: http://re-frame.eu

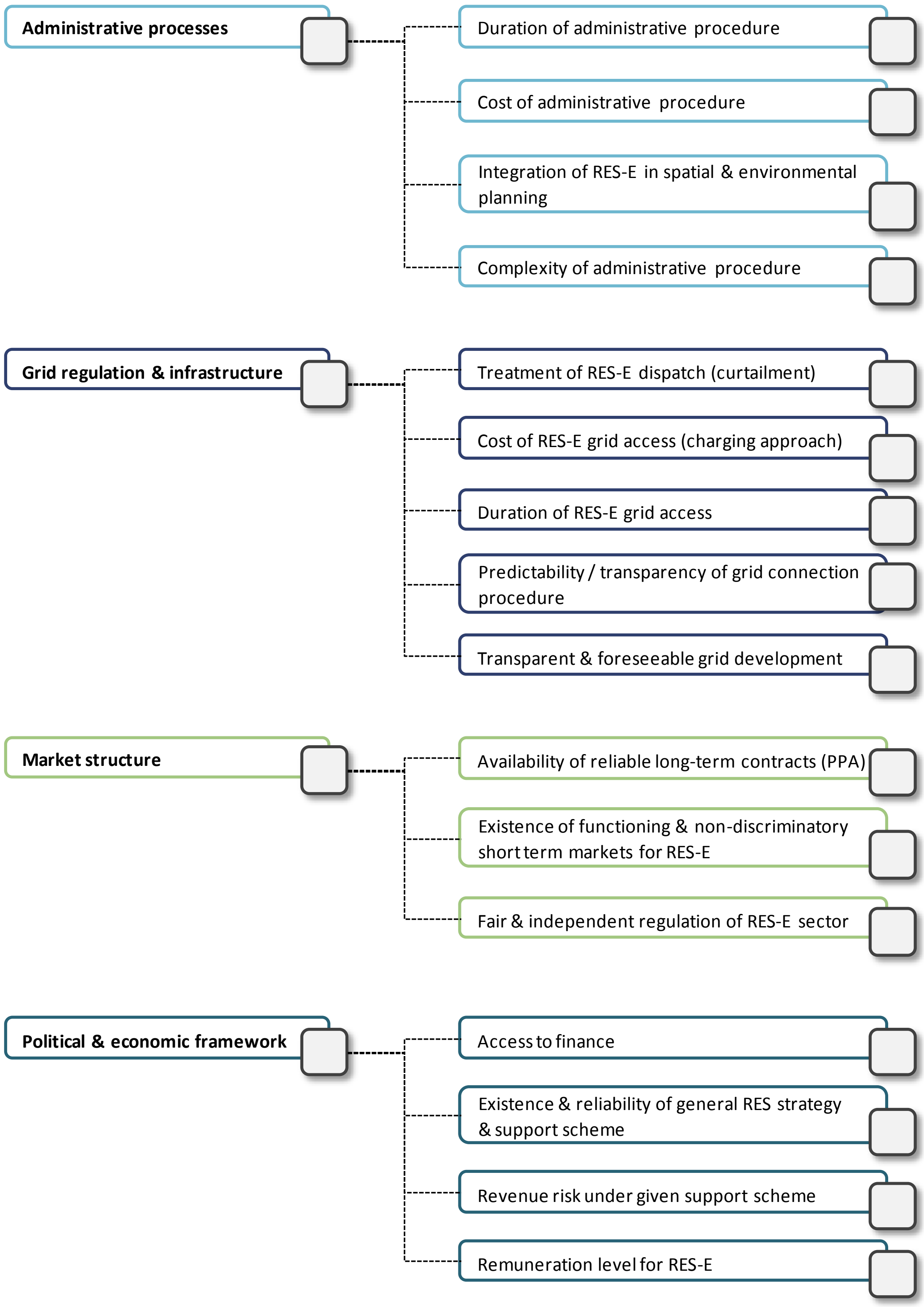

Figure A1. Questionnaire with main determinants and sub-determinants investigated in the survey. Weights are attributed to each item according for its relevance for the investment decision.

Policy performance indicators

In the scope of this Policy Brief, we focus on two indicators to measure the performance of policies supporting the deployment of renewables in the EU: 1) effectiveness and 2) economic efficiency.

For the *Policy Effectiveness Indicator,* we measure the impact of a policy on the deployment of renewables by setting the increase in renewable energy supply – normalised by weather-related fluctuations – in relation to a suitable reference quantity. The reference quantity chosen is the additional available resource potential considered to be realisable by 2030. This definition of the *Policy Effectiveness Indicator* 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 renewable energy sources proportionally to the given potential to show comparable effectiveness of their instruments.

The *Economic Incentives and Conversion Costs Indicator* reflects the economic incentives for investors and compares annualised support payments over the lifetime of a plant to the actual generation costs, more precisely to the levelised costs of electricity generation (LCOE), i.e. the generation costs including capital as well as costs of operation and maintenance. The objective of this indicator is to analyse whether payments are adequate to stimulate investments without providing excessive windfall profits for investors.

The existing indicators have been developed and continuously improved and extended in the context of various projects supported by the Intelligent Energy Europe programme (OPTRES, RE-SHAPING). For a detailed description and definition of the indicators, see Steinhilber et al. (2011).[6] The developed indicators have been applied broadly, including the European Commission's monitoring process for evaluating member state policies since 2005 (European Commission, 2005 & 2008) and by the International Energy Agency for policies in OECD countries (International Energy Agency, 2008 & 2011). Additional indicators reflecting e.g. how advanced the renewables market is in each country for a certain technology (deployment status indicator) or measuring the preparedness of electricity markets for RES-E integration (electricity market preparedness indicator) exist, but we focus on the interrelationship between effectiveness and economic incentives for investors and consider their development over time.

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[6] Please note that the time horizon of the realisable potential for this analysis has been extended to 2030, as we are already approaching the year 2020, which was the horizon in the RE-Shaping project.