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Financing Renewable Energy for Europe: The way forward

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Renewable energy (RE) is of manifold importance in the context of climate change. Despite the advantages of adopting RE as a major source of energy, several challenges have to be overcome before its wider adoption by different European Union (EU) member states (MS). The financial and economic crisis of 2008 was a great setback for the RE industry and led to a substantial weakening of policies in various EU countries. Ex post changes in Feed In Tariffs, in particular, have led to reductions in investment. So far, greenhouse gas mitigation (GHG) policies have provided a much lower incentive for RE than support policies. On the other hand, RE support policies have had detrimental effects on GHG mitigation. The harmonisation of RE support policies may eventually improve policy performance.

The POLIMP project aims to address gaps in knowledge and to inform policy at various decision-making levels regarding the implications of international climate policies currently under discussion.

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AN INTRODUCTION TO RENEWABLE ENERGY POLICIES IN THE EU

The EU Renewable Energy Directive (RED) (2009/28/EC) has set forth ambitious targets with regard to renewable energy (RE) for the EU as a whole. The EU aims to obtain 20% of the EU's energy from renewable sources by 2020. This would not only reduce greenhouse gas (GHG) emissions but would also lower the EU's dependence on imported energy. The member states (MS) have the freedom to choose which policy instrument they would like to implement for the promotion of RE based on their own energy market preferences, although they all have specific binding national targets (EC, 2014). This acknowledges that RE policies in the EU MS have evolved over time and in different directions. Figure 1 shows the use of quotas, feed-in tariffs (FITs) and feed-in premiums (FIPs) for renewable electricity in the EU MS.

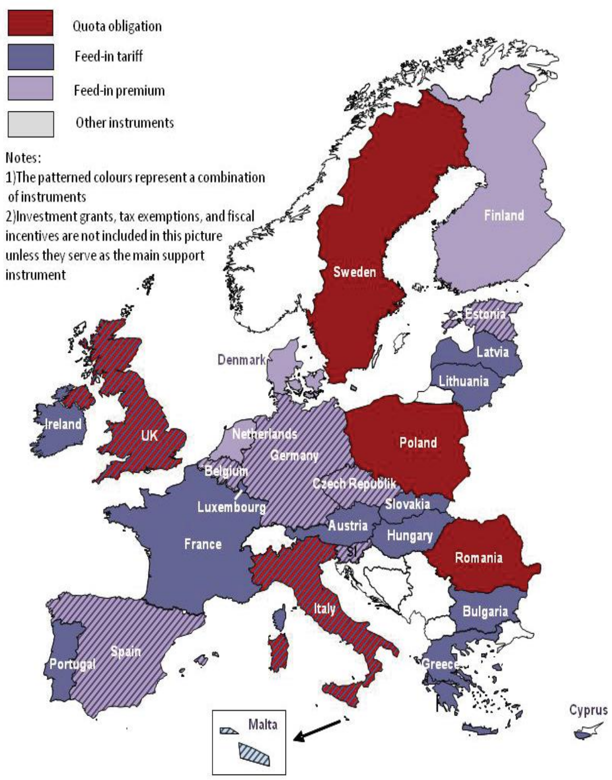

Figure 1: Renewable electricity support policy instruments in the EU 2011

Source: Ragwitz et al. (2012, p. 11).

Kitzing et al. (2012) find that over time all EU MS have introduced RE policy instruments and that RE policies have tended to converge. FITs have increasingly been used and so has the combination of several instruments at the same time. Only very few MS (the UK, Austria and Italy) switched policy instruments completely during the past decade.

Table 1: Use of RE support policies by number of EU member states

	2000	2005	2010
Provision of Renewable support	15	24	27
Provision of major support schemes FIT, FIP, TND, TGC	10	22	27
Provision of INV, TAX or FIN	4	2	1
Major support schemes			
Feed-in-tariffs (FIT)	7	16	23
Feed-in-premiums (FIP)	-	4	7
Tenders (TND)	2	2	6
Quota obligations with TGC	1	6	6
Supplementary support schemes			
Investment grants (INV)	5	10	20
Fiscal measures (TAX)	9	10	12
Financing support (FIN)	4	4	9

Source: Kitzing et al. (2012), p. 196.

Since the eruption of the financial and economic crisis in 2008, followed by the fiscal crisis, RE policies have increasingly been weakened or even dismantled. This is mainly due to the increased pressure on public budgets, but also to lobbying from industry to reduce electricity prices in order to remain competitive with the US. In many MS, FIT payments have been reduced significantly (see e.g. Grau 2014 for PV in Germany). Against this background, according to the EC (2014), a gradual move to market-based support for renewable energy is envisaged until 2017, which would mean phasing out FITs in favour of FIPs, quotas and tender programmes. This would mean a major overhaul of RE policies in the EU, whose repercussions cannot yet be fully assessed. Due to the impacts of the financial and economic crisis, we provide an overview of the literature on the cost-effectiveness of RE policy instruments, before assessing ways forward regarding policy implementation that can drive financing of RE investments. We focus on the electricity sector; for an assessment of RE support policies outside the electricity sector see Mitchell et al. (2011).

COST-EFFECTIVENESS OF RE SUPPORT SCHEMES

As long as RE have higher unit costs than fossil fuels, and the external costs of fossil fuels are not internalised in the energy price, public intervention is necessary to support the development and diffusion of technologies for RE generation. This is also due to barriers such as the high share of investment costs in the total costs as well as the intermittency and greater technology risks of RE.

Cost-effectiveness or static efficiency with regard to RE policy instruments is achieved if RE targets are reached at minimum cost to society (Ragwitz and Steinhilber, 2014). For the purposes of this policy brief we interpret cost-effectiveness as minimising the costs to taxpayers of RE support policies.

RE support is mostly either covered by the public budget or by levies added to regular electricity prices. In the majority of EU MS, with the exception of Luxembourg and parts of Belgium, the costs of RE support are imposed on electricity consumers in one way or another (EC, 2013). In this context of a financing mechanism for support schemes, cost-effectiveness refers either to minimising the costs to taxpayers (public budget) or to minimising the costs to energy end users (adding a levy per unit of energy generated additional to the energy price).

A critical trade-off is that policy instruments that are effective in achieving a rapid diffusion of RE are not necessarily cost-effective. Likewise, cost-effective instruments do not often achieve significant RE diffusion. Moreover, short-term cost-effectiveness is achieved at the detriment of a long-term reduction of newly emerging technology costs (Grubb 2013). To achieve their targets cost-effectively both in the short and long run, the EU and its MS need to design their support schemes meticulously.

Modern RE support policies are designed using a ‘price-based’ approach calculating the levelised cost of energy (LCOE) of different RE technologies. On this basis, the government sets a price that is then translated into a FIT or subsidy programme. Volume-based approaches that were applied before the economic crisis use the amount of avoided CO_2 emissions or avoided health damage, avoided fossil fuel imports etc. to determine the adequate support level. They assess the desired volume of RE estimating future RE cost development depending on technology-specific aspects and other conditions. They are now increasingly seen as inadequate as they can lead to high costs if RE costs fall faster than expected. Therefore, the majority of EU MS currently use the ‘price-based’ approach to determine adequate support levels. For example, Germany determines its support levels based on the LCOE of different technologies while the Netherlands chooses a maximum support level using tenders/auctions where the ceiling prices are reviewed every year.

All policies discussed below can be applied without differentiation according to technology, or in technology-specific tranches. The latter reduces short-term cost-effectiveness, but is likely to decrease future costs due to technological learning (Grubb, 2013). The ‘correct’ level of sacrifice of current cost-effectiveness is extremely difficult to judge because it depends on the applied discount rate as well as on assumptions regarding technological learning.

Review of the cost-effectiveness of different support schemes for mature RE technologies

Support schemes include feed-in-tariffs (FITs), feed-in-premiums (FIPs), investment subsidies, tax exemptions, quota obligations etc. In this section, we will review the cost-effectiveness of the most commonly used support schemes. We do not include direct investment subsidies or tax reductions as these instruments are less relevant in a mature RE market such as the EU.

FITs - FITs guarantee electricity sales prices for RE plant operators for a specific duration. They have been very effective in promoting the rapid expansion of RE capacity and were therefore used in a number of MS. Regarding costs, they have significant disadvantages, however. The first disadvantage is that unexpected decreases in LCOE need to be reflected in FIT levels as quickly as possible. This did not happen in a number of MS that did fix FITs for long periods and were then surprised by the decline of LCOE. Surges in RE construction and 'windfall profits' for the RE entrepreneurs were the consequence (see Grau 2014 for PV in Germany). The second problem is that FITs do not take into account electricity demand on the market, leading to overproduction and even negative prices on wholesale electricity markets. Currently, they are seen as the main reason for the current pressure on wholesale electricity prices, which has pushed gas power plants out of the market and coal power plants back in, leading to an increase of GHG emissions in various MS.

FIPs - FIPs provide a differential above the market price for electricity (IRENA, 2012*).* They can be either fixed or floating. Floating premiums require a similar assessment to the case of FITs and thus are not fundamentally different. Fixed premiums create revenue risk for investors and can slow down RE diffusion unless the change from a FIT to a FIP leads to an increase in the wholesale electricity price. Experience with FIPs remains limited to date.

Auction/tender schemes - In auction schemes, a regulatory body determines the desired quantity of RE for which, through competitive bidding by market actors, the price is determined. Tenders usually apply calls for specific technologies, capacity and locations. Theoretically, price competition ensures cost-effectiveness. However, past experience shows that winners of auctions are often unable to complete the projects because their bid price was too low and would generate losses. Therefore, penalties for winners who do not implement the projects are required, but are difficult to enforce (IRENA, 2012).

Quota obligations - Under the system of tradable quota obligations, the government fixes the volume of RE while the market determines the quota price**.** Variability of quota prices has been holding back small-scale projects compared to countries with feed-in tariffs (Ragwitz and Rathman, 2011). At present, countries using quotas have been more effective in mobilising RE than those with auctions, but less than those with FITs.

The EC (2013) has recently been focusing on short-term cost-effectiveness:

- MS should attempt to design schemes around a range of energy technologies in order to foster competition among them.
- In order to make the costs of energy transparent, competitive bidding processes should become the default allocation mechanism of support schemes.
- The internal electricity markets and European Union Emissions Trading Scheme (EU ETS) should be considered in the cost-benefit analysis of national support measures, because they are important in avoiding high costs.
- MS should create synergies with the support schemes of other MS.

FINANCING RENEWABLE ENERGY

The introduction of RE support policies as discussed in the previous section is a necessary, but not sufficient condition for the diffusion of relatively mature RE technologies, as long as LCOE of these technologies remain above those for fossil fuels and the technologies still face non-monetary barriers. In order to stimulate investments for such RE technologies the financial sector also needs to play its role, i.e. by providing equity or debt financing. The former can include venture capital, the latter project financing through elaborate instruments such as mezzanine debt. Given that the private sector continues to see the RE sector as highly risky, governments can provide 'de risking' through loan guarantees. For less developed technologies or projects (De Jager et al., 2011), direct government financing through grants remains crucial.

Box 1. Status of investment in RE from different sources in 2013 (Source: REN21, 2014)

Global R&D investment reached USD 9.3 billion, a small fraction of total investment.

Total investment reached USD 214 billion, of which 62% flowed to utility scale projects.

Public market equity reached USD 11.1 billion.

Venture capital and private market equity investment remained much smaller than the other sources at USD 2.2 billion. Clean Energy Funds are a growing source of such investment.

Clean energy project bonds saw 10 issues in 2013, totaling UD 3.2 billion

RE investment – barriers and recent downturn in the EU

The potential funding sources of RE investment are numerous, but their mobilisation remains challenging, as shown in Box 1, above. Despite 20 years of policy instrument support, most RE other than hydropower still need government support. One can of course argue that RE infrastructure should be treated like other basic infrastructures and be provided by the state. This would then create the required foundations and lessen investor risk sufficiently in order to allow RE to become a safe and attractive investment (Milford, Morey and Tyler, 2011).

Several barriers to financing RE deployment prevent the influx of greater investments, especially by institutional investors. Some of the barriers identified by De Jager et al. (2011) including lack of proper awareness in financial institutions with regard to risks and opportunities in different RE sectors, deficiency in experience with market conditions, business models etc. on the technology side, as well as risks perceived by investors on the project side, which are connected to several aspects of project implementation. Banks and other financial institutions are hesitant to extend loans for RE projects owing to a dearth of knowledge and understanding as well as the perception of the high levels of risk associated with such projects (Huijts et al., 2012).

Unfortunately, the fiscal crisis has led to a massive reduction in RE investment in Europe since the peak in 2011. 2013 values were less than half of the peak year and comparable with 2006 (see Figure 2). In 2014, the bleak trend continued (REN 21, 2014).

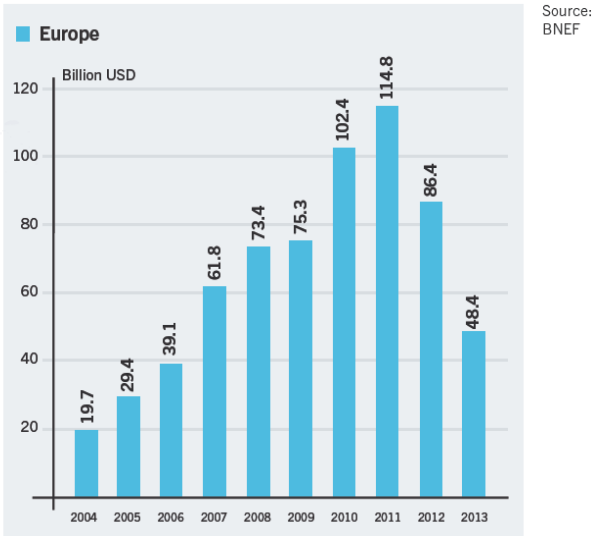

Figure 2: Renewable electricity investment in the EU

Source: REN 21 (2014, p. 69).

RE investment has particularly suffered in those markets where existing FITs were lowered retroactively.

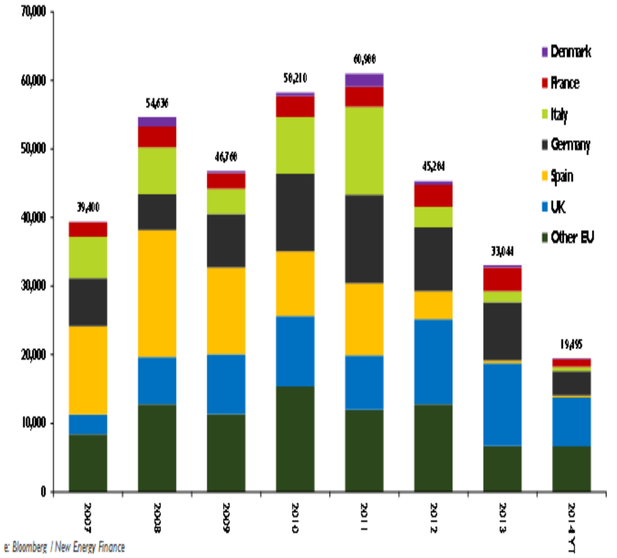

Figure 3: MS-specific investment

Source: Murley (2014).

The importance of reliable FITs is particularly visible in the case of institutional equity investors; only very recently has this link been weakened.

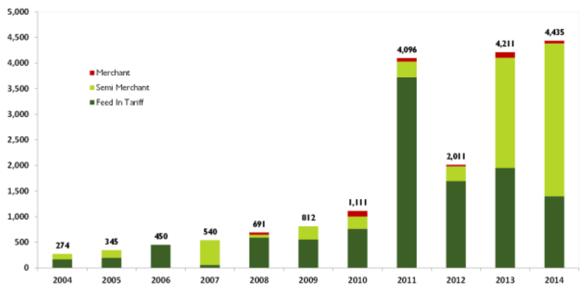

Figure 4: Investment drivers

Source: Murley (2014).

THE IMPACT OF A MULTI-LEVEL GREENHOUSE GAS MITIGATION POLICY MIX ON RENEWABLE ENERGY INVESTMENTS IN THE EU

The EU's climate policy rests on various pillars. Moreover, MS have introduced various policy instruments for GHG mitigation, which leads to a wide range of instruments influencing mitigation as well as different impacts of the role of RE.

The EU level

On the EU level, besides the goal of 20% of energy coming from RE two further policy targets for the year 2020 have been introduced in 2008 specifically for climate change mitigation: the target of 20% GHG emission reduction is underpinned by the EU ETS with an EU-wide emissions cap for the covered sectors (mainly energy, industry, aviation), and a target of 20% improvement of energy efficiency. Furthermore, specific regulatory policies for various sectors have been introduced:

- Mandatory labelling of household appliances, cars and buildings
- Prohibition of industrial gases
- CO_2 standards for cars

The EU ETS was envisaged to drive cost-effective emission reductions in the EU electricity generation and heavy industry sectors though an EU-wide carbon price. It has so far gone through three phases that have successively strengthened the stringency of allocation of allowances (EUAs), by moving allocation from the MS to the EU level. However, the financial and economic crisis led to a surplus occurring from 2008 onwards. Given that phase 3 allocation, which was for the first time performed centrally by the EC, did not foresee the long-term impact of a continually subdued industrial production, the surplus has been growing regardless. Current estimates see it vanishing around 2035; EUA prices currently lie at €6 compared to €30 before the crisis. At this historically low price level, the implicit premium for RE reaches 0.6 ct/kWh if a coal power plant is used as baseline; compared to an efficient gas power plant, the premium only amounts to 0.2 ct/kWh. All dedicated RE support policies reach an incentive that is at least one order of magnitude higher than that coming from the EU ETS in its current form.

The MS level

Climate policies in the sectors not covered by the EU ETS but by the effort-sharing decision vary widely between MS. The Scandinavian MS and Ireland use carbon taxes, which in Sweden reach levels that are two orders of magnitude higher than current EUA prices. The UK has even introduced a tax for the EU ETS sector that leads to a minimum carbon price. Translated into RE support equivalent, these tax rates would be equivalent to RE support of 2-12 ct/kWh for a coal baseline and 0.7-4 ct/kWh for a gas baseline.

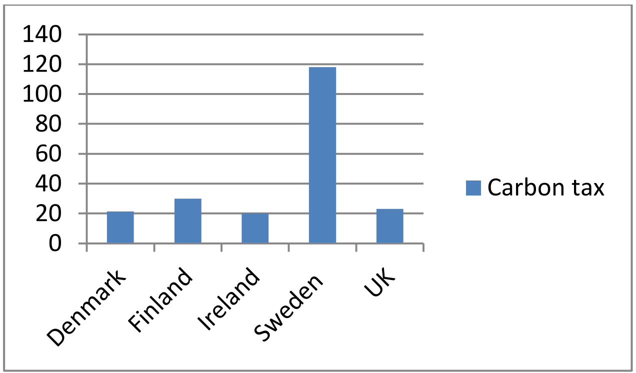

Figure 5: Carbon tax rates in EU MS (€/t), 2013

Source: Withana et al. (2013).

Interaction between GHG mitigation and RE support policies – do policies reinforce or counteract each other?

German economist Sinn (2008) has argued that climate policy only makes sense if a global cap and trade system is introduced through a 'big bang'. Otherwise fossil fuel producers would increase production to prevent their reserves from becoming worthless as long as extraction costs are marginal. This 'green paradox' would make regional mitigation policies senseless. Sinn also argues that separate RE policies are inefficient if an ETS exists as they artificially depress the price in the ETS; the allowance price should be the only driver of RE development. This overlooks the fact that developments in RE technology and their unrelenting cost reduction show that a set of robust backstop technologies for electricity production is likely to appear in the next two decades. Due to the fact that coal extraction costs are significant, the replacement of coal by RE does not face Sinn's green paradox curse. Given that coal-based electricity production is still responsible for the majority of anthropogenic CO_2 emissions, the emergence of an RE backstop would decrease the pressure placed on the climate system.

A differential between the mitigation costs embodied in RE support and GHG mitigation costs can thus be justified if there is a significant chance that the RE support will lead to scale effects that drive costs below those of the fossil alternative (Grubb 2013). The critical question that has so far not been convincingly addressed in the literature is under what conditions do such effects materialise (Mitchell et al. 2011 argue that the few studies on these effects generally achieve positive results). The history of PV costs calls for caution – the strong German FIT programme faced almost a decade of rising costs. Only the aftermath of the economic crisis and competitive pressure emerging from China led to the 'miraculous' crash in PV costs from 2008 onwards (Arvizu et al. 2011, p. 381). While in hindsight it is easy to argue that the cost crash was 'around the corner' (like del Rio, Klessmann et al. 2013), experience from technologies such as electric cars shows that blind assumptions regarding cost reductions should be avoided.

It seems robust for Mitchell et al (2011) to argue that firms underestimate the future benefits of investments into learning RE technologies or that they cannot appropriate these benefits, and thus will invest less than would be optimal from a macroeconomic perspective.

Del Rio, Klessmann et al. (2013) also argue that RE policies promote other goals than GHG mitigation such as provision of energy security and employment. The high variability of allowance prices would remove the investment certainty that has proved to be so important in mobilising RE.

One way street – RE policies influence mitigation; mitigation policies do not influence RE deployment

In the EU, GHG mitigation policies have been relatively unambitious so far. The EU ETS reached prices that can be compared to the incentives from RE support policies only for very short periods. In a number of MS wholesale electricity prices are now so low due to the addition of low operational cost RE that gas power plants are driven from the market. The GHG intensity of electricity production is thus increasing due to higher load factors for coal power plants overwhelming the effects of an increased share of RE in total power production. Moreover, incentives for electricity savings are reduced if power prices decline. It is thus imperative to design RE policies in a way that wholesale electricity prices are able to increase.

Box 2. Existing joint support schemes in the EU

The operational joint support scheme between Norway and Sweden is an example of existing cooperation mechanisms (Klessmann et al., 2014). Talks between the two countries on a joint green certificate scheme began in 2003, years before cooperation mechanisms were included in the RED (in 2008/09). Norway favoured the market-based approach to renewable energy support implemented in Sweden, but the size of the Norwegian certificate market would have been too small to establish such a scheme in Norway alone. Before the start of the joint support scheme in January 2012, the main instrument to support renewable energy deployment in Norway was investment support for wind energy. Since the 1st January 2012 the Swedish electricity certificate system has been expanded to become a common Swedish-Norwegian market for electricity certificates, implying that certificates issued in Norway can be used to fulfil the quota obligation according to the Swedish Law on electricity certificates and vice versa. Market participants with a quota obligation are primarily electricity suppliers, but also some electricity end users. The result in the form of new renewable electricity production is split evenly for accounting purposes between the two countries, regardless of where the new production is located.

The UK has plans to develop 2500 MW wind in Ireland as a joint project with Ireland, following a memorandum of understanding signed by the governments of the UK and Ireland in 2013. It is unclear if the project will be implemented before 2020. Italy has a memorandum in place with Serbia regarding the development of joint hydropower projects in Serbia.

HARMONISATION OF RE POLICIES AND CO-OPERATION MECHANISMS IN THE EU

A more harmonised or coordinated support mechanism would give a stronger incentive to mobilise investments for RE in Europe. As described above, RE policies differ substantially between MS. Harmonisation is normally defined as a top-down implementation of common, binding provisions concerning the support of RE throughout the EU (Bergmann et al., 2008); it could also happen in a bottom-up fashion, but much more slowly. A harmonisation of EU support schemes has been discussed in the past few years at the political level given that each EU MS currently has its own support scheme. Economic efficiency gains on the EU level could be made if technologies received similar support in different EU MS and expanded where they are cheapest. A secondary reason to look for harmonisation is that some current EU support schemes may contradict EU state aid rules. There is a wide range of 'full' to 'minimum' harmonisation depending on the combination of *what* options (i.e., targets, support schemes, design elements, support level) and *how* options (i.e., whether decisions are taken at EU or MS level). However, harmonisation might prevent frontrunners moving ahead of others, and stall progress if one had to wait for the laggards.

In order to create value, a host country with a cheap and/or large potential for RE generation and a user country with a limited and/or expensive potential for RE generation would need to come together and cooperate (see Box 2 on existing Joint Support Schemes in the EU). A certain share of the generation required in the user country would then be met by additional generation in the host country. This leads to cost savings in the user country, while the support costs in the host country increase, but at a lower rate than the support costs decrease in the user country. As a result, net support cost savings can be realised through cooperation (Ecofys, 2014).

The allocation of the generation of electricity from renewable sources to the host country will not only impact the support costs, but also redistribute the indirect costs and benefits induced by RE generation. Even though the effect of their redistribution on the overall net benefit is likely to be small, the allocation of RES-E may induce a distributional inequality in terms of indirect costs and benefits and their monetary value. (Caldes et al., 2013).

CONCLUDING DISCUSSION AND POLICY RECOMMENDATIONS

Given the context of the world's rapidly changing climate, a rapid reduction in costs of a whole array of RE technologies is required. Several issues need to be addressed in order to implement optimal RE policies to combat climate change. RE technologies need to be assessed in relation to the domestic situations in different EU MS, as well as their energy needs and priorities. Important questions arising in the context of RE policies are discussed below.

How to implement cost-effective RE policies

Cost-effective RE policies require the involvement of all participating actors in the decision processes regarding modifications of support schemes. For example, if all stakeholders in a support scheme agree to maintain support levels but introduce a new levy and eliminate overcompensation, the cost-effectiveness of RE support can be ensured without difficulties. Cost-effectiveness is a matter of choice of instruments; implementing the right design parameters and the best mixes of policy instruments is thus crucial. Important design features for cost-effectiveness are long-term legal commitments, flexible support schemes, transparency, planned review periods and the implementation of cost-control mechanisms, as well as the accomplishment of cooperation mechanisms and harmonisation.

How to encourage and increase financing for RE

Although investments in RE have increased substantially, the need for financial and non-financial policy support must be underscored. The reasons for this can be ascribed to the lack of a level playing field for renewables compared to conventional energy technologies (De Jager et al., 2011). So far, investors have evaluated opportunities to invest in RE projects of various technologies, which have been supported in some way or another by national or regional government incentives. This leads to complex project finance preparations and an incremental approach to making investments. Developing novel mechanisms with the dual aim of risk alleviation and allowing and incentivising the influx of new sources of financing is needed (Milford, Morey and Tyler, 2011). De Jager et al. (2011) suggested several options to improve the financing for RE, which include the reduction of risks specific to different technologies, and the reduction of policy risks such as the unannounced reduction of FITs.

How do mitigation policies and RE support interact?

No significant RE support is provided for current, low carbon prices in the EU ETS. While some economists argue for the abolition of specific RE support policies, the majority agree that RE policies are justified due to the existence of non-climate change related policy targets, such as energy security and job creation.

MS-specific mitigation policies, such as carbon taxes, currently have no impact on RE generation unless directly covering the electricity generation sector. This is only the case for the carbon price floor in the UK, whose level is equivalent to 0.7 – 2 ct/kWh depending on the baseline. RE support policies have led to a reduction of the wholesale electricity price, crowding out gas power plants, and thus increasing the load factor of coal power plants. Overall emissions from the electricity sector have thus increased in recent years. This feature of RE policies is highly problematic, as it both reduces incentives for electricity savings and makes it more difficult to eliminate coal power generation. Measures to increase wholesale electricity prices are therefore needed. For example, a levy could be charged on the wholesale electricity price to prevent the crowding out of gas. The most direct approach would be to levy a tax directly on coal power generation.

How to achieve greater harmonisation of RE support schemes across the EU?

A full harmonisation of the EU support scheme is unlikely in the short term, but a better coordination and the use of cooperation mechanisms could be a first step. Harmonisation should not become a pretext for 'freezing' RE support policies. Up to 2020 only a limited number of projects under the cooperation mechanisms are likely to emerge, but a few pilot projects could provide important lessons. Several EU member states are considering the opening of their support schemes to foreign investors in order to avoid conflict with state aid rules. The future of the cooperation mechanisms depends on the EU 2030 energy and climate framework that is currently under discussion. If there are no binding national targets for renewables, the EU's internal cooperation mechanisms may lose their role. For example, if there is an EU-wide target within a uniform support scheme applied throughout the EU, there is no role for cooperation mechanisms except for joint projects between MS and third countries. The need to open up EU support schemes based on EU state aid provisions, however, may be a trigger for more convergence of the support schemes, regardless of the detailed design of the 2030 energy and climate framework.

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- Eleonora Arcese, Research Associate at Climate Strategies
- Miles Austin, CMIA
- Chandreyee Bagchi, University of Zurich
- Andrzej Blachowicz, Climate Strategies
- Pavel Bobek, Embassy of Czech Republic
- Corina Bolintineanu, German Renewable Energy Federation
- Germana Canzi, REEEP - Renewable Energy and Energy Efficiency Partnership
- Bruno Claessens, Apere
- Graham Cooper, Environmental Finance
- John Costyn, DECC
- Lena Donat, Ecologic Institut
- Paul Drummond, UCL ISR
- Claudia Fruhmann, University of Graz
- Noriko Fujiwara, Centre for European Policy Studies
- Andreas Gunst, DLA Piper
- Kirsty Hamilton, Low carbon Finance Group
- Erwin Hofman, JIN Climate and Sustainability
- Ari Huhtala, CDKN
- Gunther Jancke, BMW Foundation
- Alena Janeckova, Embassy of Czech Republic
- Friso de Jong, European Bank for Reconstruction and Development (EBRD)
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