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UNIVERSITY OF CAMBRIDGE
Electricity Policy Research Group

Implementing the EU Renewables Directive

EPRG Working Paper 0908

Cambridge Working Paper in Economics 0913

Karsten Neuhoff

Abstract

The European Renewables Directive requires Member States to deliver on average 20% of their final energy consumption by 2020 using renewable energy sources. To deliver this target, Member States have to adjust planning procedures, evaluate energy market design, provide grid and supply infrastructure, and implement support schemes that limit regulatory risk for finance. The paper discusses how quantitative policy indicators can allow governments to measure and manage the successful implementation of the necessary policies to deliver the renewable targets. The indicators need to be designed so that they can focus on individual components of the policy framework and measure whether the envisaged annual deployment level of a technology is compatible with the framework in place in a country. Increased transparency provided by policy indicators facilitates management of policy implementation, enhances accountability of governments and can inform the reporting of Member States to the European Commission. This allows technology companies to have confidence in projected deployment levels and triggers private sector investment in the supply chain to provide the necessary production capacity.

Keywords Renewables Directive, Intermediate Indicators, Targets.

JEL Classification H77, L50, L94, O14, O33

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UNIVERSITY OF CAMBRIDGE
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Implementing the EU Renewables Directive

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Karsten Neuhoff

In December 2008 the European Parliament, Council and Commission passed the Renewables Directive. It obliges Europe to increase its share of renewable energy deployment from 6% to 20% of total energy supply by 2020. This is a visionary policy that creates an opportunity for Europe to move towards a long-term climate stabilisation scenario.

The Renewables Directive ensures that the European economy can move along its emissions reduction trajectory while continuing to use energy and enjoy economic progress. To achieve this objective Member States must adopt a policy framework that adjusts planning procedures, evaluates the energy market design, provides grid and supply infrastructure and implements support schemes that limit regulatory risk for finance. A failure to pursue any one of these changes risks the successful deployment of renewable energy technologies.

Naturally, the complexity of the policy framework does not allow one to easily characterize the overall success of any single policy decision. The nature of such decisions in the renewable energy sector illustrates that a policy barrier limiting project finance may only become clear after removal of any barriers to the supply chain, and barriers to the supply chain may only become apparent once barriers to project planning and grid access are clear. This raises a question of how to design a policy framework that ensures the sufficient removal of *all* barriers to renewables deployment.

Recently, policy indicators have received an increased level of attention with respect to policy implementation. Such indicators have facilitated benchmarking, information exchange and monitoring of effective implementation of policy decisions, and the use of indicators has enabled targets to become an integral part of policy design. International processes, such as the implementation of the European Commission's renewable electricity Directive

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2001/77/EC, represent successful applications of quantitative policy indicators.

This paper discusses how quantitative policy indicators and targets for selected aspects of the policy framework can:

- contribute to the effective and comprehensive implementation of national policy frameworks that facilitate sufficient deployment of renewables;
- enhance accountability of politicians, senior civil servants and private sector actors for future generations;
- increase the visibility of policy for the private sector to facilitate early investments in the supply chain.

Increased transparency provided by policy indicators facilitates management of policy implementation, enhances accountability of governments, and can inform the reporting of Member States to the European Commission. This allows technology companies to have confidence in projected deployment levels and can trigger private sector investment in the supply chain to provide the necessary production capacity.

More so, in the broader context of the European Renewables Directive, quantitative policy indicators can help to create a harmonised European approach which facilitates cross-country comparison and learning.

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Implementing the EU Renewables Directive

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March 2009

The European Renewables Directive requires Member States to deliver on average 20% of their final energy consumption by 2020 using renewable energy sources. To deliver this target, Member States have to adjust planning procedures, evaluate energy market design, provide grid and supply infrastructure, and implement support schemes that limit regulatory risk for finance. A failure to pursue any one of these changes risks the successful deployment of renewables.

The paper discusses how quantitative policy indicators can allow governments to measure and manage the successful implementation of the necessary policies to deliver the renewable energy targets. The indicators need to be designed so that they can focus on individual components of the policy framework. They can then measure whether the envisaged annual deployment level of a technology is compatible with the framework in place in a given country. Increased transparency provided by policy indicators facilitates management of policy implementation, enhances accountability of governments and can inform the reporting of Member States to the European Commission. This allows technology companies to have confidence in projected deployment levels and triggers private sector investment in the supply chain to provide the necessary production capacity.

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Implementing the EU Renewables Directive

1. Introduction

In December 2008 the European Parliament, Council and Commission passed a Renewables Directive that obliges Europe to increase the share of renewable energy from 6% to 20% of final energy by 2020. This is a visionary policy that creates an opportunity for Europe to move towards a long-term climate stabilisation scenario.

Figure 1 illustrates that the gap between business as usual emissions and the level that is compatible with stabilisation of carbon emissions at 450ppm is increasing over time. While initial emission reductions might be viable with efficiency improvements and fuel shifting; the final emission target can only be achieved with continued economic growth in large shares of renewable energy (Stern 2006).

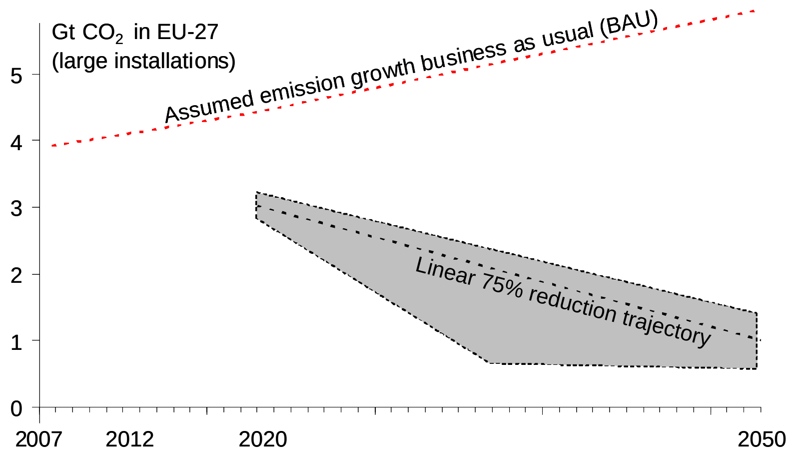

Figure 1. Stylised emission trajectory – business as usual versus stabilisation scenario

The Renewables Directive ensures that the European economy can move along the emission reduction trajectory while continuing to use energy and economic success. The Directive supports investment in the future of European economy and society in a similar fashion to the public's investment in schooling and Universities, which has enhanced European competitiveness and well-being. Governments can, however, fail to implement strategic decisions due to other priorities. Three critical factors influence the successful implementation of the Renewables Directive:

First, large scale deployment of renewable energy sources requires changes to financial support schemes, network regulation, regional planning, permit processes, and energy market design. If any one of the changes is not pursued effectively, then deployment will be halted in the respective country.

Second, renewable energy sources are in competition with conventional energy and can reduce the value of some coal and nuclear power stations. This can create incentives for some utilities to lobby against renewables or to obstruct their deployment. The typical strategy of such lobbyists is to request delayed action until the information base is improved, as successfully demonstrated by oil and power companies during the Bush administration.

Third, industry has ample experience with the volatility of government policies; as a result, private companies hesitantly invest in production capacity for wind turbines when demand depends on future government decisions. Without early private sector investment in the supply chain, however, the achievement of the renewable targets will be expensive or difficult.

This paper discusses how quantitative policy indicators and targets for selected aspects of the policy framework can:

- contribute to effective and comprehensive implementation of national policy frameworks to facilitate sufficient deployment of renewables;
- enhance accountability of politicians, senior civil servants and private sector actors for future generations;
- increase the visibility of policy for the private sector to facilitate early investments in the supply chain.

By the 30th of June 2009, the European Commission has to provide guidance for Member States on the reporting of their national renewable action plans. Quantitative policy indicators could form part of the template for this reporting. Indicators can increase the visibility of future renewable markets – and thus facilitate private sector investment in the supply chain and projecting activities. Confidence in growing markets also encourages firms to invest in innovative activities and increase their exploration of cost reductions options, thus increasing the benefits of renewables policy (Aghion et al 1997; Neuhoff et al 2007).

2. How much guidance from governments?

Background

With the liberalisation of energy markets, governments shifted responsibility for purchasing, investment and operation decisions to the private sector. This was expected to deliver strong incentives for cost and price reductions, more economic technology choices and better project execution.

The theoretical model of liberalised energy markets envisages that governments limit themselves to setting the market design and a clear regulatory framework. Production and delivery of energy becomes the responsibility of private firms.

In practice, the public perceives energy provision as a public service and holds governments responsible for excessive prices or supply interruptions. This creates strong incentives for government to intervene in the market. The clear regulatory and market interface between government and energy companies sometimes becomes blurred. This is illustrated by the response of UK power companies to government pressure; ‘voluntary’ commitments are offered by power companies to support the fuel-poor.

In contrast to such implicit government interventions, renewable energy support schemes are explicit market interventions.

Three types of market failures are cited as justification for a deviation from technology-neutral energy market regulations. First, initial costs of early-stage technologies are high and decrease with experience and technology-learning (IEA 2000). Even companies that did not invest in the new technologies themselves can benefit from these insights and produce the new technology at low costs. However, the initial investor does not capture these benefits for society and, without government support, reduces investment in the new technology to below the socially-optimal level. Second, difficulties stem from incomplete cost internalisation of environmental and security-of-supply externalities for conventional technologies (Fouquet 2008; Grubb et al 2005; Roques et al 2006). Third, barriers set up by incumbent companies limit competition in new technology fields where they do not possess incumbent advantages. At the other end, disadvantages in scale, management expertise and contractual arrangements with the supply chain limit the number of new entrants to renewable markets.

These market failures have often been cited to justify the renewable support schemes that aim to deliver 21% renewable electricity as required by the 2001 Directive (Directive 2001/77/EC (2001). One may ask, is there a continued need for technology-specific support for much larger penetration levels, with many studies pointing to 30-40% of electricity to be produced from renewable resources by 2020?

The need for continued support of renewable technologies

For some technologies, such as on-shore wind, deployment has reached a scale at which learning externalities are declining and costs are becoming increasingly competitive with conventional generation technologies. For other renewable technologies, the infant nature of the industries means they can only achieve large scale deployment and learning benefits with technology-specific support programs. (BERR 2008).

In theory, carbon pricing mechanisms and cap-and-trade systems will result in the internalisation of environmental externalities. The carbon price created by European Union Emission Trading scheme is an example. Industry pressure, however, has resulted in generous provisions for the use of cheap CDM credits instead of domestic mitigation efforts, subsequently causing a weak carbon price (Carbon Trust 2009). A low carbon price might result in continued investment in high-carbon energy infrastructures, which is incompatible with the long-term emissions reduction targets and will result in such infrastructure being stranded as more stringent regulation is implemented. Renewable energy supply targets can shift the focus of industry investment, reducing the risk of stranded investments and further supporting the competitiveness of European industry.

The market structure of energy markets has not improved over recent years - and corporate strategies in the utility sector often remain reactive to regulatory policy, rather than pro-active in renewable energy technologies. As a result, concern remains whether new technologies will receive sufficient support from incumbent companies. Governmental support of renewable energy, designed in a way that ensures the market is accessible to new-entrant companies, will therefore remain important. The threat of entry – whether or not such entry subsequently materialises or is pre-empted by investment from the incumbents – is crucial to ensure that democratic decisions can be implemented even when they might not be supported by leaders of some incumbent companies.

These benefits of direct government intervention in technology choice need to be weighted against the risks of negative impacts on incentives for decisive project execution, efficient operation, as well as economic- and innovation-investment choices. In the past, energy technology projects were directly managed by governments or executed by monopolistic utilities. Therefore, all cost over-runs could be passed to consumers. In contrast, renewable energy projects are implemented in market environments. Feed-in-tariffs, tender auctions, or traded certificate schemes define the price or premium for renewable energy. As in any market environment, project developers retain profits from good negotiations with technology suppliers and engineering companies but also bear the risks of underperforming or delayed projects.

Renewable energy targets, pursued with effective policies, retain the incentives for efficient project execution and operation through the allocation of project risk to the project developer and operator. With a clear market interface between private sector actors and the government, the risk of regulatory capture is limited as no public administrator is required to accompany individual energy projects over long periods of time. Thus, the ‘cost’ of renewable energy targets in terms of reduced efficiency of liberalised energy markets is limited to the desired impact on the technology choice.

The European Parliament, Commission and Member State governments represented in the European Council have passed a Renewables Directive that specifies clear renewable targets and compliance mechanisms. The next section discusses whether the market requires further guidance from governments for technology choice, timing and regional distribution of renewable investments within their countries.

How specific to design the guidance for renewables?

Without guidance on technology choice, private sector actors would focus on the least-cost renewable energy technologies, currently on-shore wind, biomass and biogas from sewage and landfills. Cost of other renewable energy technologies, however, will decline with increased deployment and initial support. If such support is available, valuable options for the renewable portfolio can be developed. Without other renewable energy technology options, it will be difficult to provide the overall volume of renewable energy required. In addition, it will be increasingly costly to deliver energy at a time and location that is required (Ragwitz et al 2007). For example, the DENA study pointed to the need for an additional 800km of transmission lines within Germany by 2015 (DENA 2005).

Without guidance on the timing of investments in specific technologies, it is difficult for the technology supply chain to invest in the necessary technological improvements and production capacities. If the demand for a product is delayed by a few years, then the producer will loose the necessary trained staff, revenue and possibly go bankrupt. If the demand for a certain technology is unexpectedly high, then the necessary production capacity is missing and scarcity prices result. Instead of high deployment levels, only high deployment costs will be observed.

This suggests governments should clearly define the timing and volume of investment in different renewable energy technologies using appropriate regulatory frameworks. However, if all European countries specify identical investment quantities and time frames for specific technologies, then the respective technology producers are put in strong bargaining positions. After all, the less responsive the demand is to the price of a producer, the higher the price charged in the market.

Renewable energy support policies have to balance the demand for technology and time specificity with the need for short-term flexibility in terms of real, or strategic, scarcity prices for specific technologies. For price-based approaches, such as feed-in tariffs, the mechanism to adjust tariffs for new projects over time has to be structured appropriately. For quantity-based approaches, such as tender auctions for off-shore wind farms, an appropriate schedule of late delivery payments for the project can give investors some temporal flexibility to negotiate with technology companies. In either case, it is important to assess the interactions across European support schemes to avoid expensive competition between countries.

Whether national governments also develop some indication for the regional distribution of renewable projects within their country depends on various factors. For wind power, grid expansion costs and system balancing costs can be reduced if turbines are not only concentrated at high wind sites, but distributed across the country. This may also increase public acceptance if there is a clear perception of burden-sharing among all citizens. Finally, with better understanding of the anticipated regional distribution of generation investments, grid expansion plans can be better tailored for the expected generation network. Obviously, any such guidance needs to make an appropriate trade-off between regional diversification, regional power demand, grid expansion costs and regional resource availability.

Initial renewable energy support schemes, such as Germany’s approach during the 1990s, had regionally-specific components that were supported at the city- or state-levels. As current renewable support schemes have been enacted primarily at the national level, this regional specificity has been lost. This broadening jurisdiction to the national level was initially envisaged to encourage the development of renewable energy projects at only the most suitable sites. Increasingly ambitious renewable energy targets, however, have shifted the objective from cherry-picking the very best sites to large-scale harvesting of renewable energy resources wherever possible. Refocusing the objective towards local ownership might result in a renewed shift to define policy with regional targets. After all, in other policy fields, regional sharing is common practice and contributes to a sense of local ownership which increases public support. For example, responsibility for schooling and training in communities is often shared at the regional level.

A pragmatic approach

It is difficult to prescribe and commit to the exact technology mix or distribution of investment within countries for 2020; however, it would also be difficult to deliver the renewable targets without any guidance. A pragmatic solution might be to offer more specific guidance during the initial project phases and merge towards a broader objective further in the future. Thus, longer-term targets can provide guidance if they (i) reflect a similar level of ambition to the current policy, (ii) seem viable given current technology expectations, and (iii) are in line with the environmental requirements of climate stabilisation.

Figure 2 illustrates how countries can define specific targets for individual technology bands, for example for the time frame up to 2015, which are more broadly defined for later years.

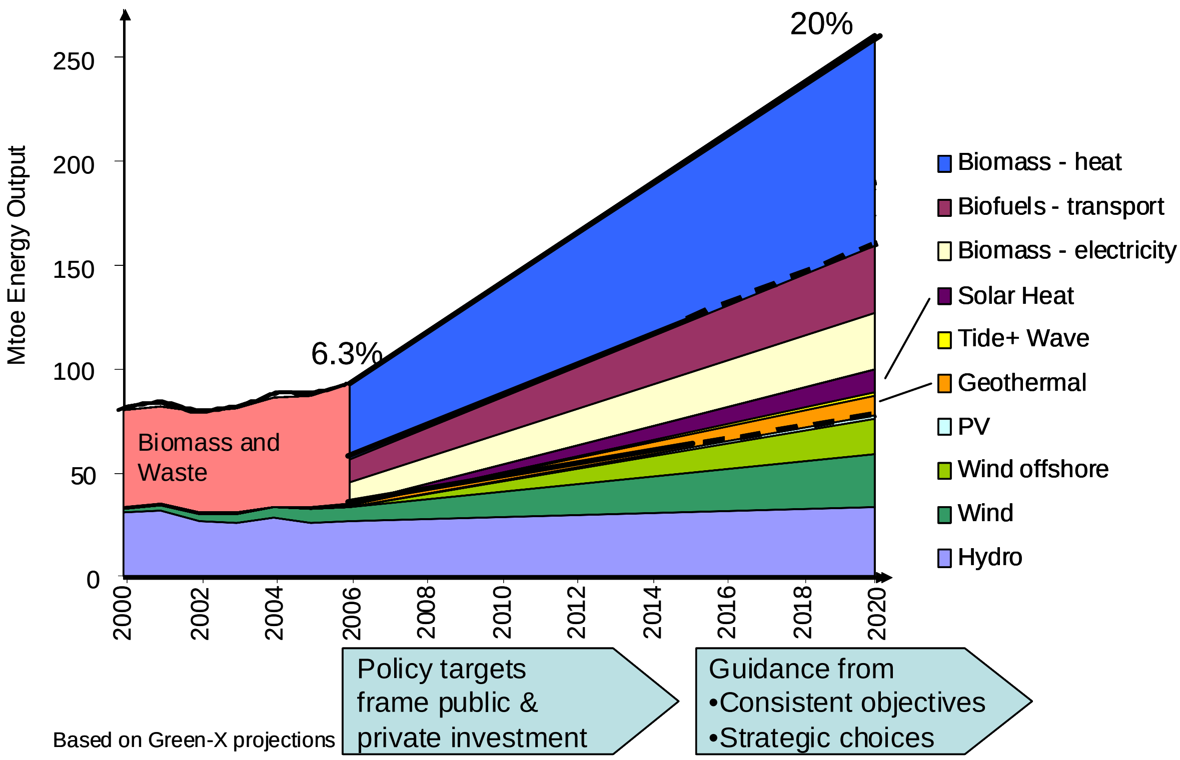

Figure 2. Possible evaluation of renewable contribution from different technologies (Source: based on Green X projections).

3. What policy framework is required?

The current infrastructure, planning regime, regulatory and market design have evolved and been tailored for existing technology mixes and fuels. To facilitate renewable energy development and reduce costs of large-scale deployment, this framework needs to be adjusted to match the requirements of renewable energy technologies (for a literature survey see Neuhoff and Sellers 2006).

3.1 Planning

Planning regimes often require complex administrative procedures for energy projects. Large scale conventional power projects often have the technical capacity to overcome this issue, but planning constraints can imply a disproportionate burden for small-scale projects.

Determining an adaptable policy framework for planning often requires policy reform: where planning constraints limit development, national governments should take action to reduce such barriers. The text box below outlines the policy reform instigated by the UK government to remove planning constraints and incentivise affordable housing schemes through the use of policy indicators and targets.

The challenge and policy response to planning constraints – example of UK housing sector

A lack of social and affordable housing due to planning constraints, amongst other factors, has lead to: ambitious building targets, increased investment, and planning system reform:

Challenge:

- Difficulties of the number of institutions involved. Public sector: Housing Cooperation, National Housing Federation, Local Planning Authorities, English Partnerships, and housing associations. Private sector: Home Builders federation, planning consultants, and developers.
- Local Planning Authorities and Regional Planning Bodies responsible for the preparation of local development documents and regional spatial strategies

Approach:

- National target: Three million new homes by 2020, two million of which by 2016. Spending Review 2004 target: Increase number of gross affordable homes to 70,000 by 2010/11.
- Local Planning Authorities set regional targets; e.g: London target of 50% affordable homes, new indicative target of 500,000 over next 3 years.
- Implementation: Local Development Documents set out a housing implementation strategy describing management and delivery of housing and land targets and trajectories.
- Section 106 of the Town and Country Planning Act 1990: enables of negotiation of planning agreements to facilitate development of affordable housing and small-scale residential sites.
- Reform of the land use planning system. New Planning Policy Statements for housing (PPS3), new Housing and Planning Delivery Grants for local councils.

Success of policy reform?

- S106 agreements have helped: in 2004/05 12% of total output of affordable housing was delivered by S106 affordable dwellings. However, completion of housing stock not rising as rapidly as the number of permissions granted for S106 agreements. This raises questions about the capacity of the planning system to deliver agreed levels of affordable housing.
- Spending Review 2004 targets met: provisional figures from the Housing Corporation show that 29,419 (in 2007-08) were provided.

(Sources: Department for Communities and Local Government (2006 and 2007); London government website (2008); Meen and Andrew (2008); Monk et al (2006); Spending Review (2004).

3.2 Infrastructure

Transport, fuel, and electricity networks have evolved, often with public support, for the current power mix. Renewable energy is produced at different locations, and might also use different energy carriers (e.g. larger use of electricity). This will require adjustments to the respective networks (Grubb et al 2008).

3.3 Market design and regulation

The market design and regulations have been tailored for conventional generation technologies and fuel sources in order to create appropriate incentives for effective use. The existing market design creates artificial constraints for large-scale use of renewable energy technologies:

Figure 3 illustrates simulation results for hourly electricity prices – assuming the UK power system accommodates increasing shares of renewables (e.g. 40% of electric energy from wind power by 2020). The 8760 hourly prices per year have been sorted in increasing order. This shows that with increasing penetration of wind power, the electricity price will drop to zero for increasing numbers of hours. This is because with large shares of wind in the system, wind power production exceeds electricity demand and the value of marginal units of electricity is low or zero. In such hours some wind output might even be spilled.

The lower prices during such hours also reduce the revenue of the other power generation resources that are required to meet demand at times of low wind output. The simulation results illustrate that, as a result, power prices get higher during other periods of the year and therefore create an incentive for investment in power generation that can meet demand at times of low output from intermittent generation.

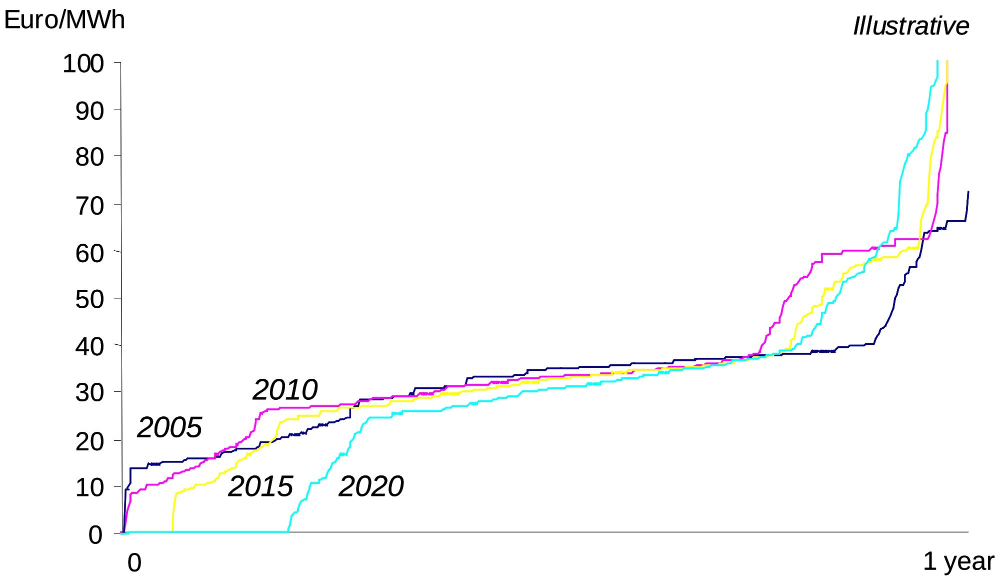

Figure 3. Simulated price-duration curve for one region of the UK with large scale wind power penetration (model description in Neuhoff et al 2008).

The model solution in Figure 3 depicts the results for one region of the country, not the entire UK. For example, in the North of the UK, wind output might exceed demand and export capacity, resulting in spilling of the wind in this region even when overall demand in the UK could accommodate the surplus. High penetrations of wind power may cause transmission constraints within countries to receive increasing attention. While adapting the network might require some increase of transmission capacity, an efficient solution to power system design will also include some congestion in the network. Building a power line that is only operated for a few hours of the year is more expensive than spilling wind output from turbines in the North of the UK for a few hours per year.

Finally, with increasing penetration of wind power, the output changes from wind turbines require shortened response times from both intermediate- and peak-load power stations to ensure supply matches demand at all times. As prediction accuracy for wind output only improves throughout the day, significant adjustments in power station operation must be made during the day. The current market design does not provide sufficient information exchange and liquidity to allow such adjustments.

This illustrates some of the aspects that future electricity market design will have to accommodate. Allowing for efficient use of the network and additional connection of power stations even in the presence of some congestion of the network, organising a flexible operation of the power system, and integrating the demand side in providing balancing services, are key to adapting market design for new technologies.

3.4 Financial support schemes

The European Renewable Directive provides Member States with the flexibility to choose their national financial support scheme. Thus, a long-standing discussion between feed-in tariffs, certificate schemes, and tender auctions did not have to be resolved at the European level before the Directive could be passed. (Mitchell et al 2006; Ragwitz et al 2006).While most of the arguments for and against the different policy instruments are well known, the larger share of renewables currently required points to additional aspects to be considered.

The volume of investment that will be required to deploy the new renewables energy resources has been increased by the 20% target somewhere in the order of 400 billion Euro by 2020.[2] Investment volume does not equate to cost for society because renewable energy technologies such as wind, tidal stream or solar replace future fuel costs. But investment projects require finance.

Figure 4 illustrates the finance structure of major European utilities as of November 2008. It shows that following high profits during recent years, utility companies have little debt. ENEL has the highest debt level, with debt corresponding to 50% of the equity level. This is perceived as substantial debt by the market; ENEL has to pay 2.5% more interest for bonds than other utility companies. Assuming all companies listed in Figure 4 would leverage their equity capital with 50% of debt, then they could raise additional 300 billion Euro funding. Obviously this is only a basic initial approximation, which ignores the impact of higher leveraging on share prices, other investment needs, and also excludes some of the utilities.

This rough calculation shows the importance of considering the financial access and investment risk for different renewable policies. The need for bond finance, new equity, or third party entry suggests that financing has to be simple and low risk. Otherwise it may prove impossible to deliver the renewable target. Tradable certificate schemes are unlikely to offer the necessary security – as the schemes combine regulatory risks about the evolution of the market design with market risks about the future scarcity level of renewables. Long-term price guarantees, as possible

[2] Assuming 2/3 of additional renewables (e.g. 1100TWh) are delivered for simplicity of calculation with wind power at 30% load factor and 1000 Euro/KW investment cost, then total cost is 420 billion Euro. This is in line with more detailed results from the Green-X project (2004).

with feed-in tariffs or tender approaches, address these concerns and are more suitable to generate the necessary finance.

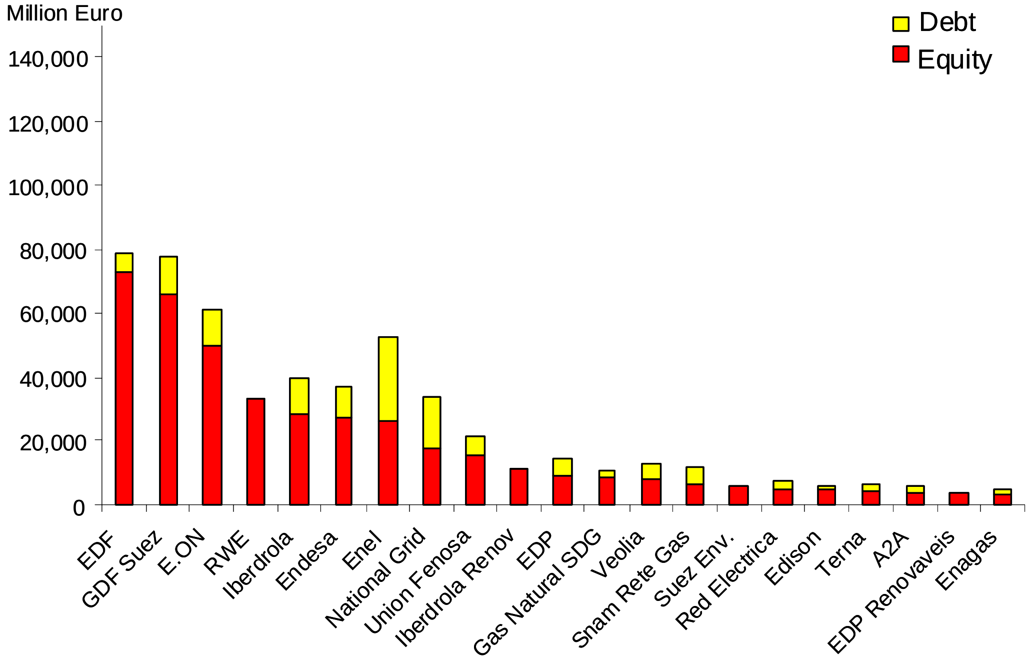

Figure 4. Finance structure of some major European Utilities.

3.5 Supply chain

Delivering of the renewable targets also relies on an increase of the production capacity for renewable energy technologies. For example, if an additional 20% of European electricity is to be delivered from wind power then 240GW of new wind turbines will have to be installed. Figure 5 illustrates that such a deployment is consistent with historic developments of deployment levels, but does require a further doubling of the wind turbine production capacity devoted to the European market.

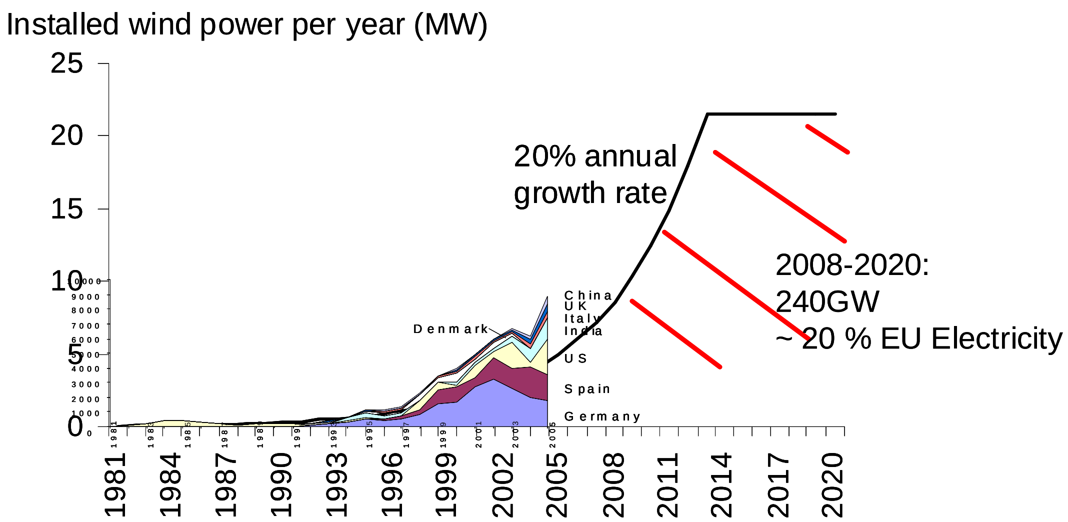

Figure 5. Annual wind power deployment if 20% additional electricity is produced with wind power. A portfolio of several renewable technologies can reduce the required deployment.

Such a large increase of production capacity and production volumes would be very desirable in the current economic downturn. As the expertise for wind turbine production and the associated supply chain is in the private sector, the necessary investment would also be shouldered by the private sector. The main requirement for this investment is trust in the existence of the future market. Rapid implementation of the Renewables Directive at the Member State level will thus be a central element not only for the delivery of the 2020 target, but also for a quick response by the private sector.

A recent study commissioned by the UK government analysed where bottlenecks are likely to occur in the supply chain (SKM 2008). This is certainly a laudable exercise, but requires further methodological refinement to allow for meaningful insights. For example, the study concluded that a shortage of installation vessels will hamper the deployment of off-shore turbines around the year 2015. If such a shortage is anticipated, then one might expect private sector investors to fill the gap with new vessels. However, if the demand is not anticipated, or if the relevant private sector investors do not have confidence in the demand projections, then bottlenecks can materialise. The enduring shortage of silicon wavers for PV cell production illustrates such an example; producers did not anticipate the continued high growth rates for PV cell production and as a result they did not provide the necessary production capacity.

4. How to ensure the policy framework is in place?

Many aspects of a renewable framework have to be in place to allow for a successful deployment of renewables (Foxon et al 2003). This is illustrated in Figure 6; many policy levers have to be in the right position to allow for the flow of renewable projects. Any one of the levers can stop the flow through the renewable project pipeline. Should renewable project deployment not achieve the desired level then it may not be sufficient to identify one lever that is obstructing deployment, as one blockage might hide the existence of other barriers that only become apparent after the removal of the initial problem.

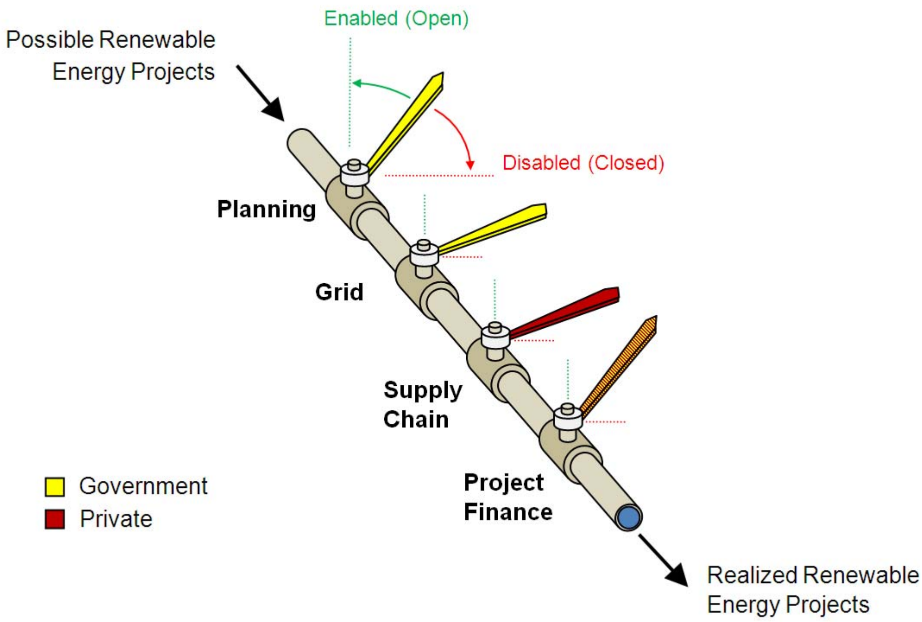

Figure 6. Critical policy levers for the deployment of renewables.

This raises the question of how to design a policy framework to ensure all barriers for renewable energy deployment are sufficiently removed to allow the necessary flow of renewable energy projects.

The role of policy indicators

Policy indicators have received an increasing level of attention with regard to policy implementation (see recent review on policy cooperation: ISDCP available at www.climatestrategies.org). Such indicators facilitate benchmarking, information exchange, and monitoring of effective implementation (Cust 2009). The use of indicators has enabled targets to become an integral part of policy design. Amongst other examples, Lester and Neuhoff (2009) summarise how policy targets have been used in the UK domestic context in the negotiation of Public Service Agreements between the local and central government. Examples are also drawn from the Government Performance Results Act of the USA, which sets targets for central administration. Policy targets are also increasingly used in international processes, including in the Poverty Reduction Strategy Papers of the IMF, in the accession process of new Member States to the European Union, and as part of the Millennium Development Goals. Quantitative policy indicators were also successfully used to evaluate the implementation of the renewable electricity Directive 2001/77/EC (European Commission 2005, Ragwitz et al 2006). Therefore quantitative performance indicators have proven their value for monitoring the implementation of European renewable energy targets. They should now be further developed and extended to the heating and transport sector.

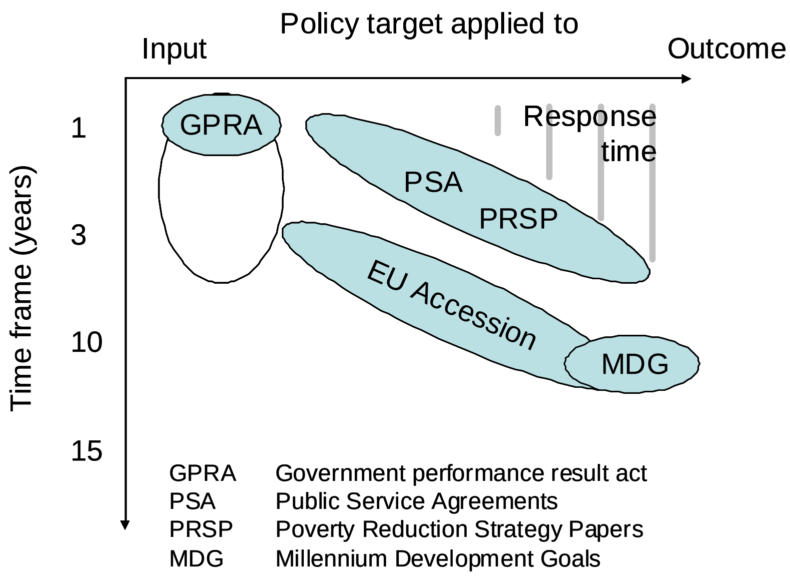

Figure 7. Time frames and outcomes used for policy targets.

The horizontal axis in Figure 7 shows that for the majority of cases, successful policy targets do not apply to the final outcome measure, such as the share of energy produced from renewables, but usually focus on intermediate indicators. This is beneficial as it allows for shorter timeframes for target definition and implementation, which allows the time-lag from policy implementation to final outcome to be managed. Moving away from final outcomes, however, has the drawback of reducing the flexibility of policy choices; the closer policy targets are linked to inputs, the more prescriptive they become for policy and low-carbon activity. The definition of policy indicators and metrics has to balance the benefits of short-time lags, which allow for effective implementation, and the flexibility provided by outcome-based metrics.

Quantitative policy indicators for effective management of renewable policy

The previous sections have highlighted the challenges for successful deployment of renewable projects; a set of quantitative policy indicators can help contribute to the delivery of the EU Renewables Directive.

The projection of technological capacity, regional efficiency, and time-scales for renewables deployment should be the starting point for the design of such indicators. It is also critical that any metrics are compatible with the national renewable energy target. Policy indicators can then quantify what percentage of the estimated project investment is compatible with the evolving policy framework. Figure 8 illustrates this approach; detailing the time-scales of the removal of barriers needed to implement a successful renewables policy. For example, a country may currently face some constraints for renewables deployment due to planning processes, but is pursuing a change to the necessary administrative procedures. In this case, planning constraints prevent the full deployment volume, and careful attention is required for future process to ensure the necessary project volume will receive approval. Transparent and credible information of this kind can help private sector investors to anticipate future demand and market opportunities, and can focus government attention to address remaining uncertainties.

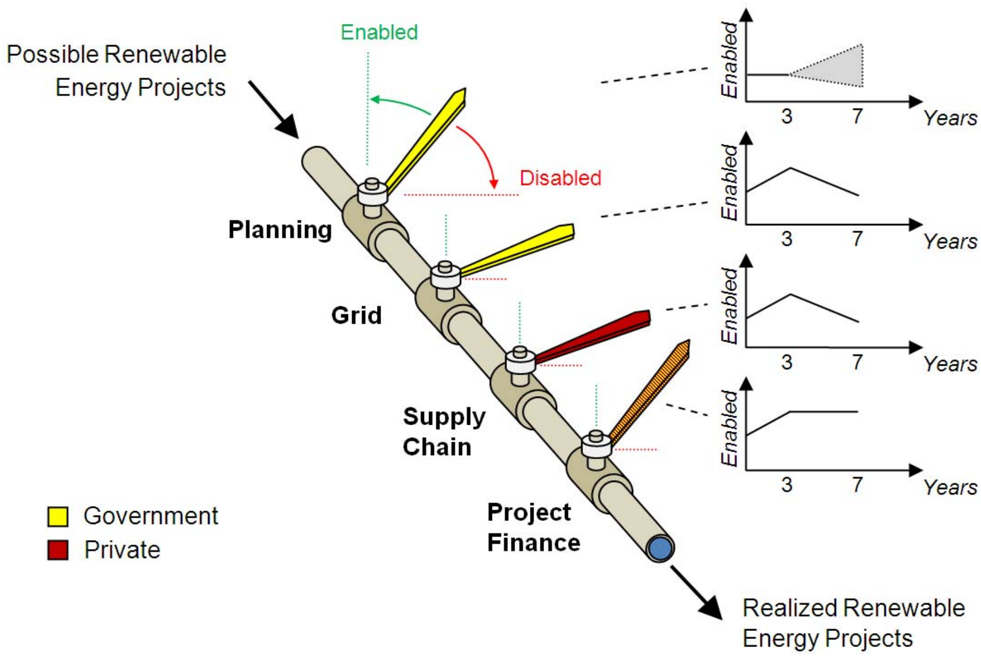

Figure 8. The role of forward looking, quantitative policy indicators.

A set of quantitative policy indicators can therefore increase the visibility of policy for all actors involved in the deployment of renewable energy technologies:

First, producers can observe that the level of future demand for their technology is supported by an effective policy framework. Second, project developers can trust the policy framework that is in place to create demand for renewable projects. Third, policy makers and governments can verify whether they have implemented the appropriate policy framework and can manage any subsequent changes required to 'free up' the project pipeline. Fourth, the public can observe whether their government has implemented the necessary national policy framework and hold their government accountable to the commitments of Heads of State, the European Parliament, and the European Commission to deliver 20% of European energy from renewables.

The quantitative policy indicators are only meaningful if they reflect a shared understanding of the policy framework and its impacts on project investments. This shared understanding does not yet exist, because so far comprehensive quantification of the individual aspects of the policy framework are not yet common-place.

Several methods, which require further development, can be envisaged to provide quantitative estimates for the different indicators. A survey among stakeholders offers one opportunity; this could provide an initial 'estimate' as a basis for further discussion with major stakeholders for renewable deployment. Such a survey would reveal where stakeholders differ in their assessment; outlining potential factual misperceptions or unforeseen policy impacts.

5. Conclusion

The European Renewables Directive requires Member States to deliver, on average, 20% of their final energy consumption by 2020 using renewable energy sources. To deliver this target, Member States have to adjust planning procedures, evaluate energy market design, provide grid and supply infrastructure and implement support schemes that limit regulatory risk for finance. A failure to pursue any one of these changes risks the successful deployment of renewables.

The paper argues for the use of quantitative policy indicators to measure the success of current and future policies. Such indicators should allow for the assessment of different policies and regulatory changes required to provide a robust framework for renewables deployment. Increased transparency provided by policy indicators facilitates management of policy implementation, enhances accountability of governments, and can inform the reporting of Member States to the European Commission. This allows technology companies to have confidence in projected deployment levels and can trigger private sector investment in the supply chain to provide the necessary production capacity.

The European Renewables Directive requires that, by June 2009, the European Commission provides a guidance note to the Member States regarding the reporting structure of their National Action Plans. This document can serve as a useful reference for this purpose. Specifying quantitative policy indicators can create a harmonised European approach that facilitates cross-country comparison and learning.

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