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The spread of renewable energy feed-in tariffs (REFITs) in the EU-25

Introduction

The goal of increasing the share of renewable energy sources (RES) in total primary energy supply as well as in electricity production of all European Union (EU) Member States (subsequently called EU-25) - and thereby contributing to a greening of the national energy policies - is tried to be reached by means of a mix of promotion instruments. The most prominent ones in the case of electricity are renewable energy feed-in tariffs (REFIT) and quota systems.

In December 2004, 16, respectively 17 of the EU-25 - if the promotion for photo-voltaic in the Flanders region of Belgium is also taken into account – are using a REFIT system (see table 1), but only 5 out of 25 EU countries (or even 6, if one consider, that Denmark already since the end of 1999 has decided for a quota system but since than has postponed several times its implementation; see also table 1) have adopted quota systems.

What are the main reasons for that kind of diffusion phenomena and why did the REFITs disseminate in much more EU countries than quota systems did? To answer this question, we will identify the factors which led to the diffusion of REFITs and to the decline of quota systems. Furthermore we ask for the influence of REFITs in success or failure of renewable energy development. Therefore we analyse the specific construction of successful REFITs in combination with the general political framework such as the natural conditions for RES, availability of fossil resources, use of nuclear power, technological (i.e. grid capacity), and cognitive environment. Finally we look at the possibilities for a uniform corpus of regulation for RES electricity valid for all EU Member States after 2005 and if this could be a REFIT system.

Theoretical approaches

To analyse the stronger diffusion of REFITs in the EU-25 compared to quota systems the authors refer especially to new approaches on diffusion theory by Tews 2004. She identifies mainly 3 bundles of factors and their complex interaction as crucial for diffusion processes: Firstly, international and trans-national factors which connects countries in the international system in a horizontal and vertical manner and therefore allows the transfer of political innovations. Secondly, national factors, which determine the tendency of innovation as well as the receptiveness versus external influences and thirdly characteristics of the political innovation itself, which can affect both its diffusion ability and mechanisms of their dissemination. In addition we use approaches on success conditions of environmental policy - applied to the promotion of RES based on works of Jänicke and own approaches (Bechberger et al. 2003; Reiche 2004) focusing on further factors influencing the success of RES promotion like geographical, political, economical, technical and cognitive framework conditions on the one hand and general structural elements in the design of RES promotion instruments like long-term security of investments, technology (and site) differentiated remuneration, compatibility with law and competition, etc.

Main characteristics of REFITs and quota systems

Regarding the two most important promotion instruments for RES electricity which are used in the EU-25, they have the following main characteristics:

REFITs show two basic features: Purchase obligation by utilities for RES electricity and guaranteed premium prices (mostly for a certain time period, e.g. 15 years) for producers of RES electricity. The specific feed-in conditions (considered RES technologies, level of

remuneration, grid access, equalisation of extra costs of RES, etc.) are normally part of an own RES regulation.
In the case of quota systems a certain amount or share of RES power is fixed (by the state) and has to be produced, purchased or bought in a given time period by a certain group of actors (suppliers, producers, traders or end customers). Quota systems are normally combined with tradable green certificates (TGCs) mainly to separate the physical power market from the TGC market and to control the compliance of the set quota. The specific conditions of quota systems (e.g. fixing of different quotas for each RES technology, level of fines in case of non compliance of quota, etc.) are (also) normally set by an own RES regulation.

Diffusion course of REFITs and quota systems
From a chronological point of view, Portugal in 1988 was the first EU country introducing a REFIT system, which – in an amended version of 2001 – is still in force. Mostly Germany (REFIT firstly introduced 1990), but also Spain (1994) and Denmark (1992) can be regarded as model countries for a REFIT approach due to the effectiveness in increasing the share of RES in the power supply. First of all the German RES Act (EEG) from 2000 set an example for other countries, which later on also decided for a REFIT system. This was the case i.e. for the Czech Republic, where the Czech Renewable Energy Association arranged a translation of the EEG and distributed it to all members of the Czech Parliament. This fact initiated a discussion about the promotion of RES through a REFIT system, which finally lead to the implementation of a respective instrument. An even stronger orientation by the German EEG can be identified in the French case. In a comparative study by the Member of the French National Assembly Yves Cochet on different RES promotion models by order of the then prime minister Jospin, the implementation of a REFIT system was recommended with explicit reference to the success of the German (but also the Spanish) promotion approach. But also in the most recent past there are examples for an orientation by model countries: The amendment of the Spanish regulation for RES electricity of March 2004 is partly orientated by the German Feed-in law of 1990 and the planned Czech RES act shows many strong similarities to the current Spanish RES promotion model. Beside this more national diffusion factors, the repeated increase of EU countries introducing REFITS since 2001 (7 new introducers)[1] can also be explained by a couple of factors on a macro level: Firstly, the necessity of a systematic support of renewable energies in the national electricity markets based on the indicative targets of the European Directive on the promotion of green electricity from September 2001 and the fact that this EU Directive didn't include a determination for one specific RES promotion model. Furthermore, the legal security concerning the conformity of the German Feed-in law with European law on competition regulations due to an identical sentence by the European Court of Justice of March 2001 as well as the great successes of EU countries like Germany, Spain or Denmark – which all used REFITs – convinced other EU member states to introduce such a RES promotion instrument.
Besides the 16 countries in the EU-28 with a REFIT system in force in December 2004, some more countries, which meanwhile changed their RES promotion approach, also used a REFIT system. This applies to Italy (between 1992 and March 1999), Ireland (until end of 1994) and Poland (1993 – 2001) (Bechberger et al. 2003; Busch 2003).
A historical glance concerning the diffusion of quota systems reveals a quiet different situation. The first EU country which decided for such a RES promotion model was the Netherlands in 1998. But the Dutch attempt to support the development of RES by a quota system only lasted three and a half year, because in July 2001 the Netherlands changed to a more demand orientated RES policy based on energy tax exemptions for green power.

[1] These are France (2001), the Czech Republic, Slovenia (both 2002), Austria, Hungary, the Netherlands (all 2003) and Cyprus (2004).

Nevertheless between 1998 and 2001 (much) more EU countries (six)[2] introduced a quota system than a REFIT (two)[3]. There are mainly three reasons for the dominance of quota system diffusion during this period: Firstly, the European Commission - as one very important external actor regarding the diffusion of policy innovations – already in a first unofficial draft of an EU-Directive for the promotion of RES in the internal electricity market of October 1998 preferred a RES support model based on quota systems. Secondly and also in 1998, the resistance of German energy suppliers against the recently amended German Feed-in law (StrEG) reached the European level: The then German supplier PreussenElektra filed a lawsuit against the StrEG by the regional court of Kiel, which forwarded the case to the European of Justice (ECJ). Not until March 2001 the ECJ decided that the StrEG was no state subsidy and therefore conform with European competition regulations. Until this sentence there was no legal security for countries thinking about the implementation of a REFIT. Thirdly, the international economic respectively neo-liberal framework conditions benefited the diffusion of quota systems because they (in economic theory) are normally perceived to comply better with the conditions of international trade, market mechanisms and competition (in general) than REFITs (Busch 2003; Reiche 2002b; Van Sambeek/Van Thuijl 2003).
After this first "diffusion wave" of quota systems between 1998 and 2001, two more EU member states opted for such a RES support model: The UK in 2002 and Sweden, as the most recent example for a country with a quota system, which started in May 2003 (Mortimore 2003).

[2] These were the Netherlands (only between 1998 and 2001), Denmark (2000, but several times postponed), Austria (only between 2000 and 2003), Belgium, Poland and Italy (all 2001).
[3] These were Estonia (1998) and France (2001).

Table 1: EU countries with REFITs or quota systems in December 2004 (Bechberger et al. 2003; Reiche 2003; Reiche 2002a; www.aroges.org)

Country	Feed-in tariff	Quota obligation + certificate trading
Austria	●	
Belgium	●[1]	●
Cyprus	●	
Czech Republic	●	
Denmark	●	○
Estonia	●	
Finland	●	
France	●	
Germany	●	
Greece	●	
Hungary	●	
Ireland		
Italy		●
Latvia	●	
Lithuania		
Luxembourg	●	
Malta		
Netherlands	●	
Poland		●
Portugal	●	
Slovenia	●	
Slovakia		
Spain	●	
Sweden		●
United Kingdom		●

● = deployed promotion instrument; ○ = introduction is planned; [1] only in the Flanders region and only for photo-voltaic

Principal driving forces and obstacles for an increased RES use in the EU-25

Besides the simple use of RES promotion instruments themselves (like REFITs) used in the EU-25, a series of further factors influence the success or failure of RES development. Regarding this, in recent research the authors identified a couple of other criteria: This are on the one side the specific design of the promotion instruments itself and on the other side geographical, political, economical, technical and cognitive framework conditions.

Favourable design of RES promotion instruments

Even there is no natural superiority of any (RES) promotion instrument, until now REFITs have shown the best effectiveness concerning the creation of new RES installations: The leading wind energy countries Germany and Spain have installed successful REFIT systems and almost all old installations in Denmark are based on this system, too. 83.8 % of all wind power capacity in the EU-25, accounting to 28,542 MW at the end of 2003, were installed in these three countries (EWEA 2004). What are the reasons for this impressive development? In the first place this is the *planning security* the three countries offered possible investors with the specific design of their REFITs. Germany, for example, guarantees investors the feed-in tariff for a period of 20 years. The new Spanish REFIT even guarantees fixed remunerations

for the whole lifetime of a RES installations. Concerning the new EU member states, only Hungary (8 years) and Estonia (7 years for biomass and hydro, 12 years for all other RES) offer investors long-term security. On the contrary, the Czech Republic and Slovenia - which also use REFITs - decide on their remuneration on a year by year basis, which is no investment security at all. Accordingly, in these two countries until now there has been hardly any new RES installations since the implementation of a REFIT. Mainly for that reason the Czech Republic is amending its present REFIT to a system similar to the Spanish one, which will also include a remuneration guarantee for 15 years.
Another very important design criteria for a successful RES development of several kind of RES technologies is the *technology-specific remuneration* for RES electricity. If the different power production costs of the individual RES technologies are considered in the form of varying remuneration, the possibilities to reach a broad RES supply or technology mix seem without doubt higher than with a uniform remuneration level for RES power. For example in Germany, the EEG established a broad promotion approach with remuneration rates depending on the technology used, the size of the plant and in the case of wind energy in addition also depending on the age and the generated power output of the installation. The success of these provisions speaks for itself: world champion in installed wind capacity, second place worldwide in installed PV plants (Bechberger et al. 2004a).

Political success conditions for RES

Taking into account the several political factors influencing the success or failure of RES development, it is important to look for the *pressure from international obligations*. The Kyoto Protocol can not be seen as a driving force for renewable energy development in the new EU countries because they have already reached far more CO_2-reduction than necessary (with the exception of Slovenia) whereas ten out of 15 EU Member States are behind their obligations set in the so-called "Burden-Sharing Agreement" of June 1998 (FAZ 7.5. 2003: 13, website EEA). Promoting the CO_2-free or neutral renewables is one way for them to fulfil the obligations from the Climate Convention. In contrast to the Kyoto Protocol, the EU-Directive on the promotion of electricity produced from renewable energy contains ambitious targets for the EU Member States (an increase in RES electricity to the total power consumption from 13.9% in 1997 to at least 22% in 2010) as well as for the Candidate Countries (from 12.9% in 1999 to 21% in 2010) and may become a crucial success condition for renewable energy development.
In most of the EU-25 *permit procedures* belong to the biggest hurdles. In Poland, for instance, between ten and sixteen different permits on local, regional and provincial level are required to apply at the Energy Regulatory Authority for a concession to build wind turbines. In Greece, another example of very complicated bureaucratic licensing, RES-installations require the agreement of more than 35 public-sector entities on central, regional, prefectural and local level; in addition the agreement needs to conform to four national laws and seven ministerial decrees.
The *administrative responsibility for renewable energies* lies with the Ministry of Economic Affairs in almost all EU-25 countries. This might be an obstacle for the further development of renewables because there are often close connections between Ministries of Economic Affairs and the traditional energy supply companies. Furthermore, top priority of politicians responsible for economy is most often cost-efficiency. This perspective is a disadvantage for renewables which are still more expensive than fossil and uranium energy (if external costs are ignored). Therefore, it might be a condition of success if the topic RES is mainly anchored in the Ministry for the Environment (as in Germany since the elections in 2002) or if there is a separate Energy Ministry like in Denmark until 2001.

Natural success conditions for RES/starting position in energy policy

There are seven countries *without nuclear power stations* in the EU-15 and six countries without nuclear power stations among the new EU member states. Some of them such as Austria, Latvia and Portugal (hydropower), Denmark (wind energy) and Cyprus (solar) belong to the countries most successful in renewable energies in Europe. There are seven countries which decided to phase out the utilisation of nuclear power: Austria, Belgium, Germany, Italy, Lithuania, the Netherlands, and Sweden. In Bulgaria and Slovakia nuclear capacity is going to be reduced. This might increase the share of renewable energies in energy supply in the long run.

Another success condition for a lot of EU-25 countries is the *dependency on energy imports*. This applies to a much higher degree for the EU-15, where in 2001 50,1% of all fuels had to be imported, but also for the ten new Member States, which in 2000 already imported 29.9% of its fuel needs. Taking into account also the Turkish, Romanian and Bulgarian energy import balance, the overall energy import dependency for the EU-28 in the year 2000 amounted to 47.3% (DG Energy & Transport 2003). Beside the improvement of the environment and creation of new jobs renewables are helping to become independent from countries such as Russia and to get an self-sufficient energy system.

Cognitive success conditions for RES

Success or failure of a stronger use of renewable energies is also very much dependent of the *public awareness* versus RES. The cognitive environment with respect to RES is very high in Northern Europe. In Denmark, for example, there are more than 3,000 co-operative wind turbines and between 100,000 and 150,000 individuals that own them. 20 per cent (~ 1.4 million customers) of the Dutch households had already decided for green electricity by January 2003[4]. By way of contrast, the public awareness is so far only developed on a low level in the new EU member states (with the exception of Cyprus and partly Latvia). The weak environmental consciousness is due to an unfavourable socio-economic situation in most of the Candidate Countries, an absence of adequate education and public information efforts in the past. In Poland, for instance, in spite of nearly 40 million inhabitants, the biggest environmental organisation has only 2,900 members.

The most important cognitive condition for success might be that a *general change in the use of renewable energies* is starting to take place: *from decentralised to more centralised applications*. This reduces prices in some cases, and in any case fits the dominant belief system of the energy industry. Co-combustion of biomass and offshore-wind energy is compatible with the traditional large-scale system. Offshore-wind energy is a realistic perspective for all EU countries with the exception of Austria, Luxembourg the Czech Republic, Hungary, and Slovakia all of which have no coasts. There are first experiences in co-combustion of biomass in coal power plants in Hungary, for example. In the Netherlands there is an agreement between government and producers that coal plants have to be as efficient as gas plants by 2010. Therefore, the producers are forced to co-combust biomass. But one should not only concentrate on these large scale options supported top-down. Wind energy development in Germany and Denmark or solar energy development in Cyprus showed that bottom-up initiatives may be a crucial success condition. Other renewables as photo-voltaic will not fit into the large-scale system. Therefore, it is also important that their development is supported bottom-up in the future.

Technical success conditions for RES

A very important obstacle in some countries is the present *grid capacity*. In France, for example, grids were not designed to take in de-centrally produced electricity but mainly to

[4] For present data see the website by Ecofys.

distribute centrally produced electricity. In Sweden, wind power is hindered by the fact that local grids need to be reinforced before being able to deploy higher levels of wind power electricity, which also applies to Spain, Portugal, Greece and the UK. In Spain, for example, it is expected that only 20–50% of the 13000 MW wind target for 2010 could be reached if no measures for a net extension will be taken. A first innovative step to solve this problem consists in a new financing scheme where all investors with a building permissions for one region pay together for the accession to the grid or for a necessary grid enlargement which reduces the costs for all involved actors. More of those forward-looking concepts to finance net reinforcements are still missing but are of crucial importance for the further growth of RES. The same applies to a fair and transparent regulation on third party access to the grid in most EU-25 countries (Bechberger et al. 2004b).
The main success conditions and hurdles for an increase use of RES are summarised in table 2.

Conclusions and perspectives

Since the introduction of the first REFITS in 1988 in Portugal, this RES promotion instrument disseminated in the majority of EU-25 (with the exception of the years 1998-2001 for the shown reasons) mostly because of the (long-term) security given for potential investors if REFITs are designed accordingly (like in Germany or Spain), its therefore better performance in a rapid RES market creation/stimulation and the (empirical) evidence of its successful deployment in some EU countries like Germany, Spain or Denmark. But beyond the favourable design of the promotion instrument itself, several other factors - as shown above - influence success or failure of the RES development in the EU-25.
Beside the GHG reduction commitments of the EU Member States in the scope of the Kyoto-protocol, mainly the *EU-RES-Directive (77/2001)* serves as a *driving force for the greening of national energy policies* as for the first time it introduced indicative targets for the share of RES-E until 2010. From about 2005 onwards, due to the report on the success of the different RES promotion systems currently in use in the EU, as provided in the EU-Directive 2001/77/EC, a Community framework on support schemes for RES electricity may be proposed which in the medium and long-term would further bring down RES prices. But even with the beginning of the EU wide emissions trading scheme in 2005 and its possibilities of linkage with an EU-RES quota system after 2005 – the existence of different RES promotion systems in the EU-25 is likely to continue also after 2005, mostly because of different regulation traditions and successes with the respective promotion system in the EU Member States. Nevertheless, a harmonisation of RES-E promotion instruments on EU level after 2010 to minimize transfer costs of a stronger RES use for society might be reached.

Table 2: Driving forces of renewable energy development in the EU-25 (Bechberger et al. 2003)

Country	Import dependency > 50 % (all fuels	Non-existence of nuclear power stations (●) or decisions to shut down reactors (●●)	Natural conditions for RES		Favourable regulation			International obligations		Cognitive environment		
			Own Coast (favourable wind conditions) /offshore wind-possibilities	Agricultural land more than 40 per cent of the territory (favourable biomass conditions)	Techno-logy specific pay-ment	Favourable payment	Long-term security	EU-Directive on RES	Kyoto Protocol	Public Aware-ness on RES	Green parties in parlia-ment	Environ-mental Ministry respon-sible for RES policy
Austria	●	●			●[2]	●	●[1]	●	●	●	●	
Belgium	●	●●	●					●	●		●	
Cyprus	●	●	●					●		●		
Czech Republic				●	●	●		●	●			
Denmark		●	●	●				●	●	●		
Estonia		●	●				●	●	●			
Finland	●	[3]	●		●			●	●	●	●	
France	●		●		●	●[4]	●[5]	●	●		●	
Germany	●	●●	●		●	●	●	●	●	●	●	●
Greece	●	●	●				●	●	●	●		
Hungary	●			●			●	●	●			
Ireland	●	●	●		●		●	●	●		●	
Italy	●	●	●					●	●		●	
Latvia	●	●	●		●		●	●	●		●	
Lithuania	●	●●	●	●				●	●			
Luxembourg	●	●			●	●	●	●	●	●	●	
Malta	●	●	●									
Netherlands		●●	●		●	●[5]	●	●	●	●	●	
Poland		●	●	●				●	●			
Portugal	●	●	●		●	●	●	●	●		●	
Slovenia	●	●	●		●	●		●	●			
Slovakia	●	●●						●	●			
Spain	●	[6]	●		●	●[8]		●	●		●	
Sweden		●	●					●	●	●	●	
United Kingdom			●				●[9]	●	●			

[1] This does not apply for PV power; [2] Only for photo-voltaic (PV) power and only in the Flanders region; [3] The Finish parliament decided to build one further nuclear power station in May 2002; [4] This applies only for wind power in overseas regions; [5] This applies only for wind power; [6] This does not apply for PV power; [7] In Spain, a moratorium on the government decision to build five new nuclear power stations has been in force since 1984; [8] This applies only for wind power on windy sites and solar thermal electricity; [9] This applies only for the long time horizon of the British quota system until 2027.

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