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Viewpoint

Policy differences in the promotion of renewable energies in the EU member states

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Abstract

The EU directive on the promotion of electricity produced from renewable energy sources (RES) has established reference targets for the share of RES electricity in each EU Member State's power supply. To reach this goal every EU country follows a different promotion strategy and some deployed instruments seem more successful in increasing the share of RES electricity than others. But we argue that there is no "natural" superiority of any instrument because the success depends on the respective framework conditions in the individual Member State on the one hand and the specific style of the used promotion models on the other. We conclude by identifying a number of success conditions for an increased use of RES: long-term planning security for investors, technology-specific remuneration for green power, strong efforts in the field of the power supply systems (grid extension, fair access to the grid, etc.) and measures to reduce local resistance against RES projects.

Keywords: Renewable energy; Promotion instruments; Success conditions

1. Introduction

The following article is an adapted version of the introducing chapter of the new "Handbook of Renewable Energies in the European Union" edited by Danyel Reiche and available since November 2002. Whereas the handbook offers a broad overview of the renewable energies situation for every Member State in the European Union this article represents a summary of the key differences concerning the promotion systems for renewable energies in the EU Member States and gives some explanations for the fact that a couple of Member States are more successful in promoting renewable energies than other EU countries even if they use similar promotion instruments.

For this reason the first part of this article will give a look on the most important framework conditions which influence the success of the applied instruments for the promotion of renewable energies. This includes the different definitions of renewable energies, the respective geographical conditions and starting positions in energy policy as well as the different international obligations of each EU Member State. Moreover, a comparative look will be given on differences in planning cultures, public awareness and technical differences concerning an increased use of renewable energies. In the second part, some examples of the main instruments for the promotion of renewable energies used in the individual EU countries like feed-in tariffs, quota obligations, tenders and tax exemptions and the key differences in their respective design will be discussed. Finally, the conclusion summarises the key success conditions for the promotion of renewable energies and draws some perspectives for the further development of green energies in the EU as well as for the future EU policy towards renewable energies.

2. Different framework conditions in the EU member states

2.1. Different definitions

Differences between the compared countries begin with the definition of renewable energy sources (RES). A common agreement is that onshore wind, photovoltaic and solar thermal energy are all generally regarded as renewable energies. Hydropower is also

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defined as a renewable source in all EU Member States, but there are also limitations. There are only a few countries which do not exclude large hydropower from their subsidy programmes. Most Member States like the UK exclude hydropower above 10 MW, in Germany the limit is already at 5 MW. There is one case (The Netherlands) that has taken small hydro-plants off the list altogether for renewables supported by the national promoting system.

A main difference in the definitions is the acceptance of electricity produced from waste incinerators as a renewable energy source. Some countries like Germany and Greece exclude waste incinerators from their RES-definition. In countries like Belgium, the UK, and the Netherlands, this was the leading "renewable" energy for many years. But since the EU-Directive for the promotion of RES electricity production has been in force since September 2001 (which has to be implemented by the Member States by October 2003), only the biodegradable fraction of industrial and municipal wastes can be promoted as a renewable energy source.

Table 1
Production of electricity from renewable sources at the end of 1999. Share in gross production of electricity

Country	Hydro[a]	Wind	Biomass	Geothermal	Total
Austria	67.4	0.1	2.6	0.0	70.0
Belgium	0.4	0.0	1.0	0.0	1.4
Denmark	0.1	7.8	4.5	0.0	12.4
Finland	18.4	0.1	12.0	0.0	30.5
France	13.9	0.0	0.5	0.0	14.4
Germany	3.8	1.0	0.8	0.0	5.6
Greece	9.7	0.3	0.0	0.0	10.0
Ireland	3.8	0.8	0.6	0.0	5.3
Italy	17.1	0.2	0.7	1.7	19.6
Luxembourg	9.3	1.7	5.0	0.0	16.1
Netherlands	0.1	0.7	3.3	0.0	4.1
Portugal	16.8	0.3	2.9	0.2	20.1
Spain	10.9	1.3	0.8	0.0	13.1
Sweden	46.2	0.2	2.0	0.0	48.4
United Kingdom	1.5	0.2	1.1	0.0	2.8
EU	∅ 12.1	∅ 0.6	∅ 1.4	∅ 0.2	∅ 14.2

Source: Eurostat, www.europa.eu.int/comm/energy_transport/etif/energy_electricity/renewable.html.

[a] Does not include pumped storage.

2.2. Different geographical conditions and starting positions in energy policy

The natural conditions for renewable energy sources differ widely across Europe. Except for Denmark, countries leading in renewable energies are countries with good conditions concerning rainfall, distribution of rainfall over the year and inflow which in turn make a high production of electricity from hydropower possible. These countries are Austria, Sweden, Portugal, Finland, Spain, Italy and France (see Table 1).

Another obstacle for renewables is the availability of fossil resources. EU Member States such as the Netherlands and the UK have access to gas and oil in their own country. If these resources run out and renewables become cheaper (in the UK wind is already cheap), the incentive to increase the share of renewable energies will grow. The same applies to the four Member States which decided to phase out the utilisation of nuclear power (Belgium, Germany, the Netherlands, and Sweden) at least over the long term when electricity production capacities has to be renewed. But following a decision by the council of the EU energy ministers, from June 2002 at least until 2010 countries like France, Germany, Spain and the UK still continue to subsidise their national coal industry, which is a clear competitive disadvantage for the further development of renewable energies. On the other hand, a country like Portugal already has a high share of renewables, because it totally depends on the external supply of fossil energy resources. Another advantage for Portugal is that there are no old fossil fuel and uranium-based energy companies that are resisting renewable energy development. The influence of energy intensive industries, such as the Swedish paper industry, can be a hurdle for renewable energy development on the one hand side. On the other hand, the Austrian paper industry is one of the largest RES-producers in the country, because it is using its wastes to produce energy.

It is not surprising that solar energy is utilised more successfully in southern Europe than for example in Sweden (located in the north of Europe). Greece is the European Union's leader in solar thermal applications with about one-third of the installed total within the 15 Member States (in panel surface/per capita terms Austria has the highest value in the EU). But despite the importance of natural conditions, one cannot explain the differences between the EU Member States and their use of renewable energies strictly in terms of resource availability. The countries with the best wind conditions in the EU are France, the UK, and Ireland. A wind turbine in Ireland can produce twice as much electricity as the same wind turbine installed in Germany. However, the installed wind energy capacity in Germany at the end of June 2002 (9841 MW) was more than twelve times higher than in Ireland, the UK, and France combined (780 MW) (www.wind-energie.de/informationen/zahlen-zur-windenergie/europa/installierte-leistung-europa.htm).

2.3. Different international obligations

The policy for the promotion of renewable energies has been influenced more and more by international obligations. There is the EU-Directive on the promotion of electricity produced from renewable energy that gives all EU Member States reference values for their

Table 2
International obligations

Country	EU directive[a] (%)	Kyoto target[b] (%)
Austria	+8.1	−13.0
Belgium	+4.9	−7.5
Denmark	+20.3	−21.0
Finland	+6.8	0.0
France	+6.0	0.0
Germany	+8.0	−21.0
Greece	+11.5	+25.0
Ireland	+9.6	+13.0
Italy	+9.0	−6.5
Luxembourg	+3.6	−28.0
Netherlands	+5.5	−6.0
Portugal	+0.5	+27.0
Spain	+9.5	+15.0
Sweden	+10.9	+4.0
United Kingdom	+8.3	−12.5
EU Total	+8.1	−8.0

Source: Reiche (2002).

[a] Increase in the share of renewable energy sources in the electricity market from 1997 to 2010.

[b] Reduction of greenhouse gas emissions from 1990 levels by the 2008–2012 compliance period.

RES-development until 2010. Table 2 shows that this is a big challenge for all countries; even the forerunners have to improve their RES-performance noticeably. The required increase for Portugal seems very small; this is, however, a significant challenge since the electrical consumption is expected to grow by more than 5% each year. In Greece, Ireland and Spain the electricity demand is also still rising, whereas the markets in countries like Austria and Sweden are characterised by stagnation and over-capacities.

At the global level, there are obligations set forth by the Kyoto Protocol. The EU has to reduce its greenhouse gas emissions by 8% of 1990 levels by 2008–2012. According to the so-called "Burden-Sharing Agreement" of June 1998, there are different targets for the Member States. Germany, Denmark, and Luxembourg have to reach the highest reductions (see also Table 2). These obligations set by the Kyoto Protocol and the EU-Directive will confirm the development in the forerunner-countries like Germany, whereas they might be an additional incentive for latecomers like Belgium.

Also the liberalisation of the electricity market can be an opportunity to enter the market for new actors who specialise in offering green electricity, in the case that the market is already fully opened. At the end of 2002 only five EU countries (Austria, Finland, Germany, Sweden and the United Kingdom) had completely liberalised their markets. At least in November 2002 the EU council of energy ministers decided to liberalise the whole EU electricity market until mid-2007.

2.4. Differences in planning cultures

Within the different framework conditions of the compared countries one of the biggest barriers for some renewable energies is the permit procedure, i.e. in Greece, the Netherlands, Spain and the UK. Their planning periods take far more time than in many other EU Member States, for example Germany. The permit procedure is mainly a disadvantage for wind energy, and the procedure works quite differently in the individual countries. In Germany, for instance, municipalities have to show in their spatial planning where it is feasible to build wind plants, which makes it easy for investors. In the Netherlands, by comparison, it is much more difficult to get a permit to build, because environmental and building permits are needed, and these permits require that local plans be changed. During this process, societal groups exert influence and there is often resistance by them for reasons such as noise pollution and particularly bird endangerment. If there is resistance, municipalities often give up their wind park plans because they prefer consensus-based decision making. They either give up their plans or the opponents go to court. In the end, it often takes many years until plans for building wind parks can be realised in the Netherlands. Greece is another example of very complicated bureaucratic licensing procedures, as RES-installations require the agreement of more than 35 public-sector entities at central, regional, prefectural and local level; in addition, they need to conform to four national laws and seven ministerial decrees. To be granted with a building permission for a wind plant in Spain often depends—beside lengthy environmental impact assessments—on requirements to the developer of a plant for special regional investments towards economic and social welfare (royalties and for example financial support for social institutions like kindergartens or libraries) which on the one hand can reduce resistance against the building of wind plants but on the other hand can be a high financial hurdle for the investors. In the UK the problems with building permissions in the past mostly based on the fact that within the (respective) tender rounds (of the so called Non-Fossil-Fuel-Obligations) hardly anything but the two most cost efficient power producing technologies—waste incineration and wind power—were considered. Concerning waste incineration this involved lengthy environmental impact assessments and both technologies also evoked local resistance, because of possible environmental pollution in the case of waste incineration and a high concentration of plants on the best windy sites in the case of wind power. For these reasons approval procedures to build such plants in the UK could easily take more than 5 years.

The question of how permit procedures work is a key variable for the willingness and motivation of investors.

2.5. Differences in public awareness

A further condition for success might be public awareness concerning renewable energies. Although opinion polls show a very positive attitude and support of renewables by the general public, this attitude seems to have a strong NIMBY (''Not-In-My-Back-Yard'') component. There are especially local resistance movements against wind energy projects. Reasons given are visual intrusion, noise, land devaluation, health problems to people and animals due to radiation, negative impact on local tourism, etc.

In Denmark there are more than 3000 co-operative wind turbines and between 100,000 and 150,000 owners of them. This co-operative model increased the acceptance of wind energy, which is the case in Germany too. Another experience in Portugal, France and Spain for example, is that small hydropower is more accepted than large plants. A crucial question is whether people are willing to pay higher prices for renewables. Thirteen per cent of the Dutch households had already decided for green electricity until May 2002. This is the highest percentage among the Member States. The reason for this is that since July 2001 private customers can decide for green electricity which also is exempted from energy taxes whereas the whole electricity market will not be liberalised until 2003. The same applies to Ireland (since February 2000) but there is no tax advantage for Irish households. So policy can influence public awareness with tax exemptions for renewables, which reduces the additional costs for green electricity or biofuels. An interesting innovation comes from Austria: electric bills for end users must contain information about the electricity mix offered. If customers can see that they receive electricity from nuclear or coal power stations, some might change to another company. There are proposals by the European Commission and the European Parliament to follow the Austrian model in all Member States. The Spanish way concerning the building of wind plants—the requirements to the developer of a plant for special regional investments towards economic and social welfare—can surely be seen as a financial obstacle but one the other side it also serves as a means to reduce local resistance. The exchange of old wind plants through new and more powerful ones (repowering) not only would be an advantage in an energetical and economical way but also would have a positive effect on the acceptance of wind plants as thus the space needed to build such plants can be reduced.

2.6. Technical differences

A very important obstacle in some countries is the present grid capacity. In France, for example, grids were not designed to take in decentrally produced electricity but mainly to 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 9000 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 (Bechberger, 2002). 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, for example in Germany and Spain (Bechberger et al., 2003).

Insufficient technologies and higher costs are a significant problem for photovoltaic and energy from tides or waves. However, wind energy shows that vast technological development is possible within only one decade. In Germany, the average investment costs of a wind energy plant was reduced from 2150 €/kW in 1990 to 865 €/kW in 1999. The average capacity of new wind energy plants increased by more than a factor of ten during the same period.

3. Different instruments for the promotion of renewable energies

Beyond the different framework conditions in the singular EU Member States which influence the success of renewable energies also the deployed instruments for their promotion play a crucial role. The main instruments for promoting renewables are feed-in tariffs, quota obligations, tenders and (energy) tax exemptions. In most cases countries decide for one of these instruments (but there are also some examples like Austria which use a combination) and connect this with other political instruments such as subsidy programs (which are sometimes financed by the revenue of energy taxes), soft loans, tax allowances, exemptions for renewables from energy taxes, information campaigns, etc. In some federal countries like Belgium and Austria, the political promoting system is very complex; some authors speak about a ''chaos.'' In the nine different *Länder* of Austria there are nine different decrees concerning the payment for renewables, leading to about 100 different tariffs for only a tiny portion of the total electricity production. All these prices vary greatly, with highest and lowest prices showing relations of 32:1 for photovoltaics and 8:1 for biomass. Table 3 shows the most important instruments for the

Table 3
Instruments for promoting renewable energies

Country	Feed-in tariff	Quota obligation	Tenders	Exemption from energy taxes	Parts of the revenue of energy taxes finance RES
Austria	●	●	●*		●
Belgium	●*	●			
Denmark	●	○			
Finland	●				
France	●			●	
Germany	●				●
Greece	●				
Ireland			●		
Italy		●			
Luxembourg	●				
Netherlands				●	●
Portugal	●				
Spain	●				
Sweden	●	○		●	
United Kingdom		●			●

●, present promoting system; *, only in one region; ○, introduction is planned.
Source: Reiche (2002).

promotion of renewable energies used in the 15 EU Member States.

Some pressure groups, especially some wind energy associations, emphasise the crucial role of favourable regulation and supportive feed-in tariffs. These minimum payment systems are indeed very successful: the leading wind energy countries (in terms of installed capacity) Germany (9841 MW) and Spain (3737 MW) have feed-in tariffs and almost all old installations in Denmark (2571 MW) are based on feed-in tariffs. But it is questionable to suppose that there is a "natural" superiority of any instrument. There are also many countries with feed-in tariffs which are not very successful in the wind energy sector, like Finland (39 MW) and Greece (311 MW) for example.[1] This shows that success depends on the specific construction of the tool.

The success of countries using feed-in tariffs like Germany or Spain-until now mostly recognisable in an increased use of wind power as well as photovoltaic in Germany—has several reasons. In the case of Germany one explanation is that the German feed-in law offers investors long-term security through guaranteed and fixed tariffs for a period of 20 years on a relative high level (i.e. the remuneration for electricity from new wind plants in 2002 amounts to 8.86 €cts per kilowatt hour (kWh)). Further reasons for the success of the German promotion system are the existence of strong financial subsidy programmes like the 100,000 Roofs Photovoltaic Programme. With 0.51 billion € of investment support, it is the world's biggest support programme in this area. In Spain there are two (main) tariff options for green electricity. One is an annual guaranteed fixed tariff which remains the same throughout the year (2002: 6.28 €cts/kWh for wind energy) and the other is a market related tariff, paying producers the equivalent of the electricity market price (2002: monthly average of 3.6 €cts/kWh) plus a production incentive (in form of a premium) (2002: 2.9 €cts/kWh). Both tariff options are adjusted every year by the government in accordance with market predictions for the coming year, but always in a price corridor of between 80% and 90% of the pre-tax consumer price of electricity, as stipulated by 1997's electricity sector law. In comparison to the German model the Spanish offers less investor security also due to the fact that the remuneration is only guaranteed for 5 years and a renewal of the purchase contracts is not automatically included. So in the Spanish case the success of wind energy also has other reasons apart from the promotion system itself as for example the above-mentioned requirements to developers of wind plants for regional investments towards economic and social welfare (Bechberger, 2002; McGovern, 2002, p. 39). On the other side a country like Greece which also uses a feed-in system to promote wind energy with guaranteed purchase contracts longer than in Spain (10 years) including a renewal option and a level of remuneration comparable to that of Spain or even higher (70–90% of the domestic consumer tariff which amounts for 6.1–7,5 €cts/kWh), only reaches a small fraction of the installed capacity in Germany or Spain. This could be explained with several negative framework conditions as high administrative hurdles concerning building permission (35 public-sector entities involved), a strong

[1] All data refers to the installed wind capacity at the end of June 2002, see www.wind-energie.de/informationen/zahlen-zur-windenergie/europa/installierte-leistung-europa.htm

NIMBY-effect and a limited capacity of the power transmission grid.

In the Netherlands, which have an attractive system of tax advantages, investors are more careful because there is no security at all. Regulations can change from year to year and there have been examples of this happening. In September 2001 for example, the Dutch government announced that beginning in January 2002, hydropower would not be exempted from the energy tax anymore.

Another important success condition is that there is a technology-specific and in some cases also a location dependent differentiation in the promoting systems. Photovoltaic (PV) energy is still more expensive than hydropower, wind, and biomass. In Germany, Portugal, and Luxembourg, for example, there are different feed-in tariffs. In 2002, photovoltaic electricity from new installations received the highest payment in these countries: 48.1 €cts/kWh in Germany, 49.9 €cts/kWh in Portugal and 61.45 €cts/kWh in Luxembourg, which is the highest payment among the Member States. Besides this in Germany the remuneration is only paid for installations on buildings smaller than 5 MW. To reduce the unnecessary sealing of open spaces the cap for installations there is already set by 100 kW. In Portugal the mentioned payment for PV electricity only applies to plants smaller than 5 MW, for bigger ones the remuneration amounts only to 28.4 €cts/kWh. In Luxembourg the highest payment for PV power only counts for private installations whereas electricity from PV plants by municipalities are only remunerated with 31.45 €cts/kWh. Above that in Germany and Luxembourg the payments follow a degressive style: Every year new German PV installations get a 5% lower remuneration as the year before. In Luxembourg there are two more degression steps for new PV plants (2003: 0.5 €cts/kWh and 2004: 0.45 €cts/kWh). With this technical differentiations not only the respective electricity production costs are considered in a better way but also the criticism often mentioned for example by the Competition Directorate-General of the European Commission that fixed price systems would lead to an exaggerated financial promotion of renewable energies and would hinder their technical progress because of a missing internalisation of future cost reductions within the fixed feed-in tariffs. For this reason the German feed-in system in the case of wind energy also includes a differentiation of the payments according to the location of a wind plant. This means that for more windy sites the high remuneration from the start will be reduced quicker as for locations with lesser electricity production amounts.

On the other side in a country like the Netherlands, all renewables get the same promotion: the exemption of the energy tax. Thus, it is not surprising that the German solar-market is rapidly growing whereas the Dutch market is only growing slowly.

The UK is another example for a EU Member State that for a long time followed a failed promotion approach and now risks making the same mistakes again, despite a change in the promotion system to a quota obligation: as explained above—while the NFFO tender model hardly only considered the two most cost efficient technologies (wind power and electricity from waste incineration) because of the high price pressure during the tender rounds, the new quota system provides all renewables with the same remuneration: the pool price, the earnings from the trade of green certificates and a (energy) tax exemption. This once again will be an advantage only for the most cost efficient technologies. Diagram 1 at the end of the article shows an overview.

4. Conclusion and perspectives

Until now only Member States like Germany or Spain which offer a long-term (planning) security for investors with their promotion system through fixed feed-in tariffs for green electricity show still fast growing rates mostly in the field of wind energy and partly in photovoltaics too (Germany). But also other conditions are needed to stimulate a stronger use of and a switch to renewable energies: a technology-specific remuneration of green power, clear and transparent measures concerning planning and building approval, strong efforts in the area of the power supply systems (grid reinforcement or extension, fair access to the grid, etc.) and last but not least steps to reduce local resistance against RES projects, as requirements to developers for regional added value like in Spain or a strong financial participation of the local population in wind plants like in Denmark or Germany.

From a perspective point of view one can notice that a general change in the use of renewable energies is starting to take place: from a decentralised to a more centralised application. This reduces prices in some cases and fits the dominant belief system of the energy industry. Co-combustion of biomass and offshore-wind energy is compatible with the large-scale system. Offshore-wind energy is a realistic perspective for all countries in the EU with the exception of Austria and Luxembourg which have no coasts. There are experiences in co-combustion of biomass in Austria and Ireland, for example. In the Netherlands there is an agreement between the government and producers, in which 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 which are supported from the top-down. Wind energy development in Germany and Denmark showed that bottom-up initiatives may be a crucial success condition. Other renewables like photovoltaics will not fit in the large-scale system. Therefore, it is also important that their development is supported from the bottom-up in the

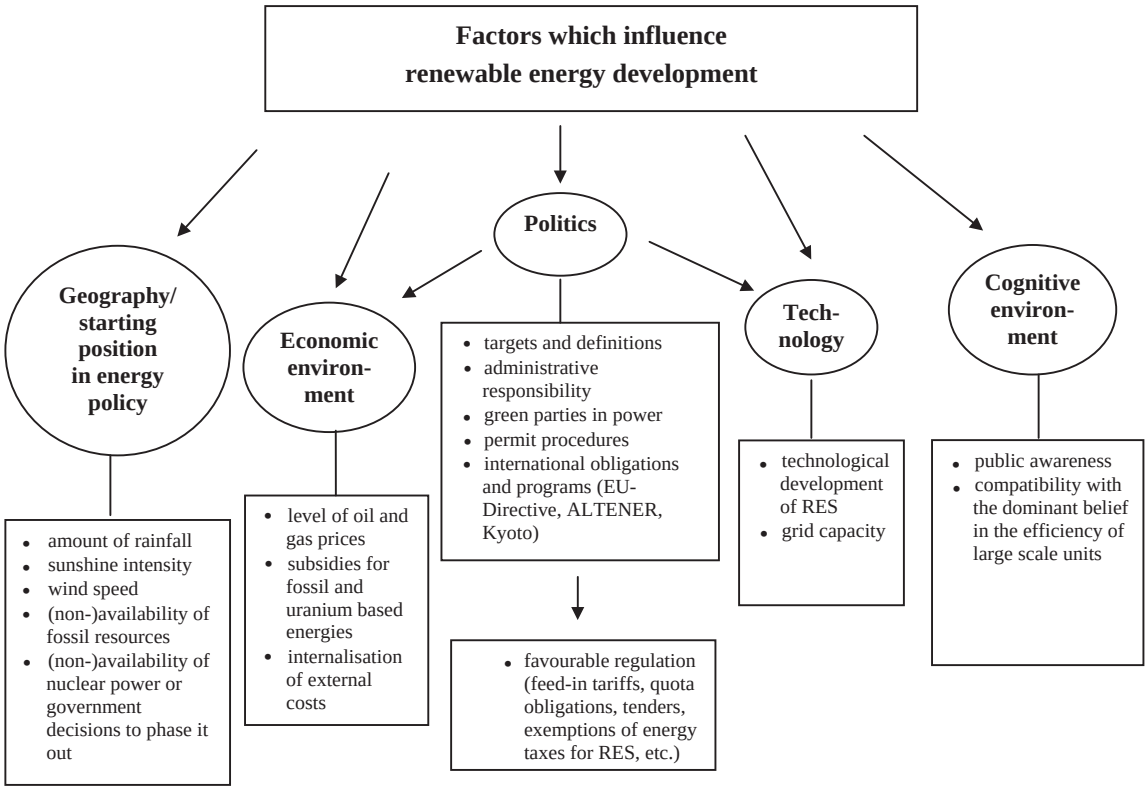

Diagram 1. Reiche (2002).

future. But as a press release, published by the European Renewable Energy Federation (EREF) and the World Wildlife Fund for Nature (WWF) on 30 October 2002, warned that one of the most important targets of the EU-Directive for the promotion of RES electricity—the increase of the share of RES electricity to 22% in 2010—will be missed by 5–7%, both kind of measures, centralised applications as well as more bottom-up initiatives, has to be pursued. One way to reach this goal, beside the endless debates about the best promotion instrument, could be a stronger reduction of the still huge subsidies for fossil and nuclear energy (1999: $ 300 billion at global level, see: Scheer 1999, 153pp.) and a redirection of a part of them for a stronger financial promotion of renewable energies.

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