



Renewable energies in the EU-Accession States

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Abstract

The aim of this article is to discuss obstacles and success conditions for renewable energy sources in the EU-Accession States and to compare them with the framework in the EU-15. Besides the ten states which will join the EU in 2004, Bulgaria and Romania which will probably join in 2007 as well as Turkey are analysed. Most of these countries have had a century-long tradition in the utilisation of RES, primarily in biomass and hydropower. However, the communist regimes were convinced of the superiority of large-scale systems and converted the energy sectors into centralised units. Due to this dominating belief system more decentralised applications such as installations using renewable energies had to close.

One crucial driving force for future renewable energy development in the Accession States comes from the stipulations set by the EU. The EU-Directive on the promotion of electricity produced from RES gives the new EU-members targets for their RES-development until 2010. Due to the Directive many Accession States have already begun to pay more attention to the topic and to introduce more systematic policies. Six of the Accession States have introduced minimum tariffs which were one of the main success conditions (besides a stable and sound investment programme as well as favourable background conditions) in the leading wind energy countries Germany and Spain. Beside the external pressure by the EU and other international obligations other driving forces such as the path dependencies in the national energy policies (degree of coal, oil and gas exploitation, nuclear power use, import dependency), the political support schemes for renewable energies, possibilities of obtaining external financial support and the cognitive environment are discussed. Finally similarities and differences between EU-15 and Accession States are worked out.
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1. Introduction

In this article the framework conditions of renewable energy sources in the EU Accession States are analysed. Beside the ten states which join the EU in 2004 analyses were also undertaken of Bulgaria and Romania which will probably join the European Union in 2007 as well as Turkey (accession date is still unclear). Most of these 13 Candidate Countries have had a century-long tradition in the utilisation of renewable energy sources (RES), primarily in biomass and hydropower. However, the communist regimes¹ were convinced of the superiority

of large-scale systems and converted the energy sectors into centralised units. Due to this dominating belief system more decentralised applications such as installations using renewable energies had to close. In Latvia, for example, all small hydropower plants were decommissioned between 1963 and 1977 (Krug, 2003). In the recent history there was a better environment for renewables in the Accession States. Old hydroinstallations are reactivated, the use of biomass is being extended and wind, solar as well as geothermal paths are taken up.²

²Among the Eastern European countries only Romania does not fit in this analysis. Even in comparison to Western European countries it was a pioneer which started promoting all types of renewable energies already back in the late 1970s. After the fall of the communist regime development of renewables stagnated in Romania due to decreasing investments from the public budget (Dinica, 2003).

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¹Cyprus, Malta and Turkey were not connected to the Soviet Union and had no communist regimes.

This aim of this article is to investigate the driving forces of a further diffusion of renewable energies in the EU-Accession States.

This article is based on the “Handbook of Renewable Energies in the European Union II—Case Studies of all Accession States” edited by myself and available since October 2003.³ All the 13 case studies in this handbook have been carried out using the same format. At the beginning of each case study, a definition of renewable energies is given for the individual country. The starting position in energy policy and the main actors are then described. Next, the instruments for promoting renewable energies are shown and each section concludes with an analysis of current obstacles and conditions for future success. This considers that success or failure cannot only be explained with the choice of particular instruments. The background conditions have also to take into account, as it was also always emphasized by the Environmental Policy Research Unit at the Free University of Berlin (Jänicke, 1996).

2. Starting positions in RES-use

Latvia is the leading nation among the Candidate Countries regarding the use of renewable energy sources. As Table 1 shows two thirds of the produced electricity came from renewables in 2001.⁴ In Latvia, Romania, Slovenia, Slovakia, and Turkey as well the share of renewables in the electricity market is above average due to natural conditions, which make a high production of electricity from hydropower possible. In all the other Candidate Countries the impact of renewables is relatively low with only a one-digit share of the electricity market.

Apart from hydropower and partly biomass (wood fuel) all the other types of renewables are mostly in an initial stage of development in the Candidate Countries. Wind energy, for example, is only used in seven out of 13 Candidate Countries (Czech Republic, Estonia, Hungary, Latvia, Poland, Romania, and Turkey). In these seven countries together less than 100 MW were installed until 2002 which is not even 0.5 per cent of the whole European wind energy capacity.⁵ But there are

³This book is the second collection of systematic case studies describing national renewable energy policies in Europe. The first edition was published in 2002 under the title “Handbook of Renewable Energies in the European Union—Case Studies of all Member States” (Reiche, 2002). A summary of this book is published in Energy Policy 32 (2004) under the title “Policy differences in the promotion of renewable energies in the EU member states”, pp. 843–849 (Reiche and Bechberger, 2004).

⁴The leading role of Latvia regarding renewables is restricted a little bit due to the fact that the country imports a large share of its electricity consumption (in 2002, 37 per cent, see Krug, 2003).

⁵Own calculations according to the contributions to Reiche (2003a, b) and BWE-website (www.wind-energie.de, 30.6. 2003).

Table 1
Share of renewable energies in the Candidate Countries in electricity and primary energy production, 2001^a

Country	RES electricity production, 2001	RES primary energy production, 2001
Bulgaria	8	0.4
Cyprus	0	3.7
Czech Republic	3.6	1.7
Estonia	0.1	11
Hungary	0.5	3.6
Latvia	66.3	31.4
Lithuania	0.8	8.2
Malta	0.2	0
Poland	1.9	2.4
Romania	28	8.9
Slovenia	27.9	8.7
Slovakia	18.5	5
Turkey	20.8	12.6

^aThe sources are the case studies in this book. (Most of the authors got their data from their national statistical offices.) The Turkish data and the share of RES in the Romanian TPES is for the year 2000 and taken from the IEA (IEA, 2002).

also some examples that weaken the latecomer image of the Candidate Countries. Cyprus has more solar collectors installed per capita than any other country in the world. The Czech Republic is forerunner in the field of bio-fuels; they already amount to seven per cent of all automotive fuels. In Poland there are more than 100,000 small-scale wood heat plants. Hungary is a pioneer in geothermal energy which is used for district heating in as many as nine towns.

Which factors then influence RES development in the Candidate Countries? Beside the natural conditions RES use can be explained with the path dependencies in the specific national energy policies. The question whether fossil resources are available and nuclear power is used can often answer success or failure in the field of renewables.

3. Path dependencies

Poland has the highest percentage of coal in its electricity market world-wide. The country will be the most important coal nation in the enlarged European Union. In 2001 more hard coal was produced in Poland than in Germany, Great Britain, France, and Spain together. Table 2 shows that, in 2001, more coal was exploited in the Candidate Countries (4553.22 PJ) than in the EU-15 (4017.03 PJ). As in Poland the availability of coal and the lobby of this sector (which has “captured” government and regulation authorities, see Reiche, 2003b) are the biggest obstacles for renewables in the Czech Republic. Not the finiteness of this fossil source (which is in both countries not in sight) but

Table 2
Coal exploitation in the enlarged European Union, 2001 (in PJ)
(German Hard Coal Association, 2003)

Country	Hard coal	Lignite
Austria	—	14.65
Finland	—	55.67
France	31.1	5.86
Germany	835.05	1538.25
Greece	—	366.25
Ireland	—	17.58
Spain	275.42	58.6
United Kingdom	796.96	—
EU-15	1960.17	2056.86
Bulgaria	—	225.61
Czech Republic	322.3	606.51
Hungary	2.93	117.2
Estonia	—	87.9 ^a
Poland	2402.6	439.5
Romania	73.25	202.17
Slovakia	23.44	26.37
Slovenia	—	23.44
Candidate Countries	2824.52	1728.7

^aOil shale.

rather environmental considerations and especially the ongoing privatisation of the coal sectors in Poland and the Czech Republic might further reduce the share of this fossil fuel in energy production and increase the importance of other energies such as renewables.

Regarding oil and gas, all Candidate Countries—with the exception of Romania (see Table 3)—mainly depend on imports. In the former communist countries these imports mainly come from Russia. Whereas general policy has been looking to Western countries and organisations for more than one decade, in energy policy there is nearly the same structure of dependence on Russia as before 1990.

In the gas sector of some countries (Poland and Turkey, for instance) long-term contracts with foreign suppliers were signed. These contracts are so-called 'take or pay'-contracts. If the economies and energy markets do not grow as expected the ordered gas has to be used first before other energies such as renewables can be increased. The average import dependency of the Candidate Countries is lower than of the EU-15 (see Table 3). This can be explained mainly with the availability of fossil resources in four of the countries: All types of fossil resources are available in Romania on a large-scale (Table 4).

Due to its coal resources Poland has an import dependency which is even lower than the Romanian one but this will gradually change due to the increasing use of gas in new dwellings and oil in the growing traffic sector. As Poland the Czech Republic is a leading coal producer. A special case is the mining and combustion of domestic oil shale in Estonia. On the contrary, Malta

Table 3
Import dependency in the Candidate Countries, 1999 (www.europa.eu.int/comm/energy/en/altener2.htm, 30.6. 2003)

Country	Solid fuels	Oil	Natural gas	All fuels
Bulgaria	31.3	94.4	102.6	48.5
Cyprus	85.7	102.5	—	100.5
Czech republic	−28.9	95.1	96.3	25.0
Estonia	10.5	92.9	100.0	38.2
Hungary	25.3	75.1	73.9	54.3
Latvia	67.0	83.5	103.5	57.8
Lithuania	69.9	86.0	100.0	53.5
Malta	—	100.0	—	100.0
Poland	−25.8	95.5	67.2	9.9
Romania	25.5	36.2	18.5	21.9
Slovenia	22.5	100.4	99.4	55.5
Slovakia	77.4	97.3	91.4	68.7
Turkey	33.3	89.0	95.0	61.4
Candidate Countries	−3.7	85.2	72.9	36.9
EU-15	47.0	72.0	44.7	47.6
Average EU-28	27.6	73.7	49.2	45.7

and Cyprus are completely dependent on imports. The import dependency of Slovakia and Turkey is over 60 per cent, that of Hungary, Latvia, Lithuania and Slovenia over 50 per cent. This means that eight out of 13 countries have to import more than half of their fuels. An increased use of renewable energies would enable them to reduce their import dependency.

There are six countries without nuclear power stations among the Candidate Countries. It is no surprise that some of them such as Latvia and Turkey (hydropower) as well as Cyprus (solar energy) belong to the forerunners in renewable energies. Altogether there are 26 reactors in the Candidate Countries, one more is under construction in Romania (the money taken from the Romanian state budget to realise Cernavoda 2 is missing for investments in renewables, see Dinica, 2003).

Whereas in Western Europe many countries decided to phase out nuclear power after the Chernobyl disaster in 1986, among the Candidate Countries only Poland followed these examples when more than 85 per cent of the inhabitants in the concerned Gdańsk-province had voted against the already partly built nuclear power station in Żarnowiec in a referendum in 1990. In the accession process to the European Union phasing out nuclear power is a key issue. To shut down the least safe nuclear reactors became part of the accession agreements. Until 2009 eight reactors—which means nearly every third one—have to be closed (there will be financial support from the European Bank for Reconstruction and Development, EBRD, for the decommissioning of the reactors). This requirement from the EU might become one of the main driving forces for future renewable energy development.

Reactor	Type	Net capacity in MW	Start of construction	Start of commercial operation	Shut down or scheduled shut down
<i>Bulgaria</i>					
Kozloduy 1	VVER 440/230	408	1970	1974	2002
Kozloduy 2	VVER 440/230	408	1970	1975	2002
Kozloduy 3	VVER 440/230	408	1973	1980	2006
Kozloduy 4	VVER 440/230	408	1973	1982	2008
Kozloduy 5	VVER 1000/320	953	1980	1987	
Kozloduy 6	VVER 1000/320	953	1982	1991	
<i>Czech Republic</i>					
Dukovany 1	VVER 440/213	412	1978	1985	
Dukovany 2	VVER 440/213	412	1978	1986	
Dukovany 3	VVER 440/213	412	1978	1986	
Dukovany 4	VVER 440/213	412	1978	1987	
Temelin 1	VVER 1000/320	921	1983	2000	
Temelin 2	VVER 1000/320	921	1983	2003	
<i>Hungary</i>					
Paks 1	VVER 440/213	437	1974	1982	
Paks 2	VVER 440/213	441	1974	1984	
Paks 3	VVER 440/213	433	1979	1986	
Paks 4	VVER 440/213	444	1979	1987	
<i>Lithuania</i>					
Ignalina 1	RBMK 1500	1185	1977	1983	2005
Ignalina 2	RBMK 1500	1185	1978	1987	2009
<i>Romania</i>					
Cernavoda 1	Candu 700	655	1979	1996	
Cernavoda 2	Candu 700	655	1980		
<i>Slovakia</i>					
Bohunice V1-1	VVER 440/230	408	1972	1978	2006
Bohunice V1-2	VVER 440/230	408	1972	1980	2008
Bohunice V2-1	VVER 440/213	408	1976	1984	
Bohunice V2-2	VVER 440/213	408	1976	1985	
Mochovce 1	VVER 440/213	388	1984	1998	
Mochovce 2	VVER 440/213	388	1984	1999	
<i>Slovenia</i>					
Krsko	PWR 640	676	1974	1983	

4. Political support schemes

Table 5 gives an overview of the instruments for promoting renewable energies in the Accession States. Preferential tax treatment like a reduced Value Added Tax (VAT) for RES-systems in Malta is the most common (and often only) type of instrument. In Hungary there is a so-called “20,000 roofs with solar thermal energy by 2010 program” (Ürge-Vorsatz et al., 2003) but the only step that has been taken to achieve this ambitious target so far was—just as in Malta—to decrease the VAT rate of solar collectors (in this case from 25 to 12 per cent). To increase the use of solar

collectors Malta also refunds the applications fees for such installations.

In some countries such as Bulgaria, Hungary or Poland environmental funds exist which also support projects in the field of renewable energy. The revenues of these funds come mainly from fees and fines. Latvia has the broadest policy mix for supporting renewable energies. A special innovation comes from Slovenia which has introduced a CO₂-levy proportional to the carbon content which makes coal significantly less and renewables more competitive (biomass is considered to be CO₂-neutral) (Tomšič, 2003).

Table 5
Instruments for promoting renewable energies

Country	Feed-in tariff	Quota obligation	Tenders	CO ₂ -tax	Environmental funds ^a	Tax relief
Bulgaria					●	●
Cyprus	●					●
Czech Republic	●				●	●
Estonia	●				●	●
Hungary	●				●	●
Latvia	●		●		●	●
Lithuania					●	●
Malta						●
Poland		●			●	●
Romania						●
Slovenia	●			●	●	●
Slovakia					●	●
Turkey						●

● = present promoting system.

^aFor further details on environmental funds in the Candidate Countries see Möller (2002).

Six Candidate Countries have introduced a feed-in tariff system: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, and Slovenia. Success or failure of feed-in tariffs depend on the specific design. The amount paid, technology specific payments and long-term security for investors are important success conditions for minimum payment systems and other instruments promoting renewable energies (Bechberger et al., 2003; Reiche, 2002).

In the Czech Republic and Slovenia remuneration for renewables is comparatively high. Hydropower plants get the smallest, photovoltaic installations the highest payment whereas in Hungary and Estonia there is no differentiation between the renewable energy sources. In the Czech Republic and Slovenia investors are hesitating because they have no security for their investments. Both countries determine their remuneration on a year-by-year basis in contrast to the Hungarian feed-in tariff which is valid for eight years and the Estonian feed-in tariff which is valid for 7 (biomass, hydro) and 12 years (all other renewables), respectively.

Latvia recently switched from an ambitious feed-in tariff system with eight-year long guarantees for investments to a hybrid system combining feed-in tariffs with tenders based on annual capacity limits (caps) (Krug, 2003). Poland replaced its former feed-in tariff by a quota system. According to this obligation the share of renewable energies in the electricity market has to triple within only one decade. But a transparent and clear penalty system for distributors which do not fulfil the obligation is still missing (Reiche, 2003b).

5. External financial support

One of the biggest obstacles for renewable energy development in the Candidate Countries are institu-

tional barriers and the lack of domestic financial sources. However, there are several possibilities for obtaining external financial support (see Table 6). External support comes on global level from the Global Environment Facility (GEF) and the World Bank which finances a large geothermal project in Poland, for example; on European level through EU-programmes like ALTENER which is the only specific European programme for renewables as well as from some general European programmes like SYNERGIE, PHARE, IPISA, and SAPARD; finally, through bilateral co-operation. During the pilot phase for Joint Implementation (JI), Latvia hosted the most AIJ-projects (Activities Implemented Jointly). Of a total of 27 AIJ-projects in co-operation with Germany, Sweden and the Netherlands, 16 are located in the field of renewable energies. In co-operation with the Dutch government an ambitious 60 MW JI-wind energy project is planned in Poland which would almost double wind energy capacity in all the Candidate Countries.

6. International obligations

By 2001 the Eastern European countries had reached a far higher CO₂-emission-reduction than they had according to their obligation from the Kyoto Protocol (with the exception of Slovenia).⁶ This is mainly due to their economic restructuring. This reductions mean that there is only a low political pressure from the global level at the moment; neither can the climate convention be seen as a direct driving force for renewable energy development in the Accession States in the short term (only indirectly through the flexible mechanisms of the

⁶For exact data concerning the country-specific developments of CO₂-emissions see the UNFCCC-website.

Table 6
Possibilities of obtaining external financial support for the renewable energy sector in the Candidate Countries (Council of Ministers, 2000: Annex No. 5)

Type of Beneficiaries support investors	Foreign institutions														
	European Union			UN			Bilateral funds (take Poland as an example)								
	Development and Policy			Climate protection			Infrastructure		Investments		Technical support				
	ALTERNER II	SYNERGY	JOULE/THERMIE	FP5	PHARE	ISPA	EIB/SAPARD	EBOIR	GEF	CIF	World Bank	NL	DK/DEPA	D/FWP	S/EAES, UK/BK-HF
Loans				✓							✓				
Local authorities								✓							
R&D institutes															
Entrepreneurs															
Individuals															
Grants															
Local authorities															
R&D organisations															
Entrepreneurs															
Individuals															

Kyoto Protocol). But in the medium and long term the Kyoto protocol might be a crucial driving force for the AS due to their economic growth and the challenge to decouple economic growth and the increase of emissions.

More influential than the Kyoto Protocol are the stipulations set by the European Union. The EU-Directive on the promotion of electricity produced from renewable energy gives all Accession States targets for their RES-development until 2010. Whether the European stipulations are reached will mainly depend on the willingness of implementation by the national states because the targets are only non-binding reference values (so-called indicative targets). The AS did also agree to the high targets because they wanted to please the Commission and facilitate the accession process. But due to the Directive many Candidate Countries have already begun to pay more attention to the topic and to introduce more systematic policies in the field of renewable energies.

Table 7 shows that the targets are very ambitious for most of the countries. Poland as the biggest Accession State has to triple its renewable capacity, Estonia, for example, even has to increase its share of renewables in the electricity market by about the factor 25. But the targets by the EU are consumption targets and not capacity targets. Therefore lower energy consumption levels would be make it easier to achieve the targets.

7. Cognitive environment

Beside the lack of domestic financial sources, the cognitive environment belongs to the major obstacles for the development of renewable energies in the Candidate Countries. The weak environmental consciousness is due to an unfavourable socio-economic situation in most of the Candidate Countries, an absence of adequate educations and public information efforts in the past. Furthermore many people in the Eastern European countries fear that support of renewables will increase energy prices again. In Poland, for example, between 1989 and 1995 the price of electricity for households more than quadrupled, VAT for energy increased from 7 per cent to 22 per cent in the period 1995 to 1998 (Salay, 1999). The main reason was that cross subsidies were taken away.

In Poland, in spite of nearly 40 million inhabitants, the most important environmental organisation, the Polish section of Friends of the Earth, has only 2900 members (Reiche, 2003b).⁷

Participation of green parties in governments could be an advantage for the development of renewables in the

⁷There are some organisations with more members but they are apolitical and limit their activities on nature conservation issues.

Table 7
Annex to the Directive 2001/77/EC

Country	RES-E (%) 1999	RES-E (%) 2010
Cyprus	0.05	6
Czech Republic	3.8	8
Estonia	0.2	5.1
Hungary	0.7	3.6
Latvia	42.4	49.3
Lithuania	3.3	7
Malta	0	5
Poland	1.6	7.5
Slovenia	29.9	33.6
Slovakia	17.9	31
Community	12.9	21

Reference Values for Accession States' national indicative targets for the contribution of electricity from renewable energy sources to total electricity consumption by 2010^a.

^aIn contrast to the EU-15 the year 1999 (and not 1997) is the basis for the national indicative targets for the Accession States.

Candidate Countries but presently Greens are only part of the government in Latvia. At the last parliamentary elections in October 2002, the party formed an alliance with the Farmers' Union which gained more than 9 per cent of the votes. In the cabinet Greens are represented by the Minister of Environment.

It might be sufficient to push the issue "renewable energies" higher on the political agenda by having green parties in parliaments. However, with the exception of Latvia (3 seats) Greens are not represented in any parliament of the Candidate Countries at the moment.

In countries like Poland and the Czech Republic the co-operation between the industrial branch organisations in the field of renewable energies is insufficient. There is no joint head organisation which could put pressure on decision makers in a more effective way than single organisations that have less than 100 members.

Furthermore it is often argued that there is no environmental pressure because emissions are already declining. Even within the ecological community not everybody is convinced of the benefits of renewables. In Slovenia and Slovakia, for instance, there was resistance from environmental groups against the construction of large-scale hydroprojects. In Latvia there was a broad movement against a (realised) wind park (see Krug, 2003). Some people even in NGOs argue that energy efficiency measures are more economical and lead to quicker and bigger ecological success since the energy intensity of GDP in the Candidate Countries is considerable higher than the EU-average, as Table 8 shows. Therefore, financial support often concentrates on energy efficiency measures—the establishment of the Energy Saving Fund in Lithuania is one example for that (Katinas and Skema, 2003).

Table 8
Energy intensity^a in EU-15 and the Candidate Countries in comparison, 1999 (www.europa.eu.int/comm/energy/en/altener2.htm, 30.6. 2003)

Year	Energy intensity for the European Union (toe/M€)	Energy intensity for the Candidate Countries (toe/M€)
1992	212.5	1026.9
1993	213.4	997.3
1994	207.7	894.0
1995	207.0	883.8
1996	211.2	890.9
1997	205.1	830.8
1998	203.6	780.2
1999	198.4	744.3
2000	193.8	Data not yet available

^aDefinition of energy intensity: Energy Intensity = Gross Inland Consumption of Energy/Gross Domestic Product.

Another argument against new installations in the field of renewables are the excess capacities in many Candidate Countries like the Czech Republic, Poland, Romania and Slovenia. But the closure of the least safe nuclear reactors by 2009 (see above) will limit surpluses in some electricity markets.

Domestic NGOs and external actors often try to improve the cognitive environment through organising training courses, workshops and conferences. But improvements take time and can only be reached step-by-step.

Due to the weak cognitive environment in the Candidate Countries it is not likely that the demand side will become a driving force for renewable energy development once the electricity markets are liberalised. Electricity markets have to be fully liberalised in the EU (including the Accession States) by mid of 2007.

8. Differences between Candidate Countries and EU-15

One of the biggest differences between EU-15 and Candidate Countries concerning the chances for renewable energies is the public awareness which is very, high especially in Northern Europe. In Denmark, for example, there are more than 3000 co-operative wind turbines and between 100,000 and 150,000 individuals that own them. 20 per cent of the Dutch households had already decided for green electricity by January 2003.⁸ As described above, the cognitive environment is only developed on a low level in the Candidate Countries (with the exception of Cyprus and partly Latvia).

Another difference is the pressure from international obligations. The Kyoto Protocol can not be seen as a

⁸For present data see the website by Ecofys.

driving force for renewable energy development in the Accession States in the short term because they have already reached far more CO₂-emission-reduction than necessary 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, www.eea.eu.int/ 30.6. 2003). Promoting the CO₂-emission-free or neutral renewables is one way for them to fulfil the obligations from the Climate Convention. The AS could sell their excess allowances or credits to EU Member States.

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 as well as the Candidate Countries and may become a crucial success condition for renewable energy development.

There are more countries in the EU with favourable regulation for RES than in the Candidate Countries. The leading wind energy countries Germany and Spain have installed successful minimum payment systems. Almost all old installations in Denmark are based on this system, too, and Austria and France also introduced this tool in 2002/2003. Whereas Germany, for example, guarantees investors the feed-in tariff for a period of 20 years, the Czech Republic and Slovenia decide on their remuneration on a year-by-year basis. Only Hungary and Estonia offer investors long-term security.

In many Western European countries like Germany, Spain, and Denmark, for example, there are more domestic manufacturers producing wind turbines than in the Candidate Countries.

Contrary to most EU Member States a big hurdle for the Candidate Countries is the lack of sufficient financial resources. They are more dependent on external actors for realising capital-intensive projects such as wind parks or geothermal installations than Western European countries.

9. Similarities between Candidate Countries and EU-15

In most of the EU Member States and the Candidate Countries permit procedures belong to the biggest hurdles. In Poland, for instance, between 10 and 16 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 Member and Candidate States. 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.

There are many countries which have a stricter definition of renewables than that set in the EU-Directive on the promotion of renewables in the electricity market. Whereas the EU-Directive sets no limit for hydropower use, the UK, the Czech Republic, Romania and Slovakia exclude hydropower above ten Megawatt; in Germany and Hungary the limit is five MW, in Latvia even two MW.

There are seven countries without nuclear power stations in the EU and six countries without nuclear power stations among the Candidate Countries. It is no accident that 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—the missing availability of fossil fuels and nuclear power might be one explanation for that. 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 both the EU-15 and the Candidate Countries might be that they are predominantly dependent on energy imports (EU-15 somewhat more than the Candidate Countries, see Table 3). 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.

The most important 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 countries with the exception of Austria and Luxembourg on the one hand and Czech Republic, Hungary, and Slovakia on the other all of

Table 9
Driving forces of renewable energy development in the Candidate Countries (Reiche, 2003)

Country	Import dependency > 50% (all fuels)	Non-existence of nuclear power stations (●) or decisions to shut down reactors (■)	Natural conditions for RES			Feed-in tariffs/favourable regulation		International obligations		Cognitive environment	
			Own Coast (favourable wind conditions)	Agricultural land more than 40 per cent of the territory (favourable biomass conditions)	More than 15 per cent share of hydropower in the electricity market	Technology specific payment	Long-term security	EU-Directive on RES	Kyoto Protocol	Public Awareness	Green parties in parliament
Bulgaria		■	●	●					●		
Cyprus	●	●	●			●				●	
Cz. Rep.			●	●		●		●			
Estonia		●	●	●			●	●			
Hungary	●		●	●			●	●			
Latvia	●	●	●	●	●		●	●			●
Lithuania	●	■	●	●			●	●			
Malta	●	●	●	●			●	●			
Poland		●	●	●			●	●			
Romania		●	●		●		●	●			
Slovenia	●		●		●	●		●			
Slovakia	●	■			●			●			
Turkey	●	●	●								

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1 which have no coasts. There are first experiences in co-
 2 combustion of biomass in coal power plants in
 3 Hungary, for example. In the Netherlands according
 4 to an agreement between government and producers
 5 (the so-called coal covenant) coal plants will have to
 6 reach the level of emissions compared to those of
 7 efficient gas plants by 2010. Therefore, the producers are
 8 forced to co-combust biomass. But one should not only
 9 concentrate on these large scale options supported
 10 top-down. Wind energy development in Germany and
 11 Denmark or solar energy development in Cyprus
 12 showed that bottom-up initiatives may be a crucial
 13 success condition. Other renewables as photo-voltaic
 14 will not fit into the large-scale system. Therefore, it is
 15 also important that their development is supported
 16 bottom-up in the future.
 17

19 10. Perspectives in the Candidate Countries

21 Despite the present difficulties (and the somewhat
 22 dark picture I have sketched before) there are also
 23 reasons to be optimistic concerning future development
 24 of renewables in the Candidate Countries. Beside the
 25 described success conditions like the accession to the
 26 EU, the Kyoto mechanisms and the phasing out of
 27 nuclear power in some countries the natural conditions
 28 are in most cases very good. Whereas hydropower has
 29 been already exploited to a great extent in many
 30 Candidate Countries and there is often a tradition of
 31 using biomass for heating purposes, all the other
 32 renewables are still at the beginning of their develop-
 33 ment. On- and offshore wind energy potential is quite
 34 high in the ten coast countries, and even the landlocked
 35 Czech Republic, Hungary, and Slovakia have consider-
 36 able possibilities. Hungary has the most significant
 37 geothermal potential among the Eastern European
 38 countries, Turkey and Poland also belong to the
 39 countries with good geothermal possibilities. There are
 40 possibilities for further growth in the biomass sector in
 41 nations with a large forest and agricultural sector such
 42 as Bulgaria, the Czech Republic, Hungary, Lithuania,
 43 Poland, and Romania. Whereas solar thermal is
 44 booming in Cyprus and shows considerable growth in
 45 Poland, for instance, photovoltaic is seen as an
 46 expensive luxury in Eastern Europe. Most of the PV-
 47 installations are stand-alone applications, e.g. in the
 48 agricultural sector. Grid-connected installations are rare
 49 and mostly demonstration projects by external actors
 50 like Western petrol station companies. Progress in this
 51 field seems to be only possible if there are quantum leaps
 52 in the development of this technology which would
 53 make the use much cheaper.

54 Another success condition is the existence of domestic
 55 manufacturers producing RES-equipment. Whereas
 wind turbines and photovoltaic cells mainly have to be

imported from Western countries (therefore they are
 stigmatised), there are solar collectors manufactured in
 Cyprus, Hungary, Slovakia and Poland, for example;
 boilers and boiler equipment as well as hydro turbines
 are manufactured, e.g. in Latvia, Slovenia and Turkey.

Even in countries which are, until now, latecomers
 regarding renewable energies there are often promising
 bottom-up initiatives. After re-organisation of the
 former centralised communist states several local com-
 munities have taken the chance to initiate innovations in
 the field of renewable energies (often with assistance of
 external actors). These pioneering initiatives could
 diffuse to other municipalities.

11. Conclusion

The further evolution of RES in the EU-15 and its
 Accession States will most likely depend on a combina-
 tion of prices and political support. Putting an end to
 price distortion by removing subsidies for conventional
 fossil and nuclear energies and internalising external
 costs would be a decisive step for a better competitive-
 ness of RES. Ratification and progressive tightening of
 climate change agreements in later commitment periods
 (after 2012) will also help. 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 Commu-
 nity framework on support schemes for RES electricity
 may be proposed which in the medium and long-term
 would further bring down RES prices. Also, the EU has
 an important self-interest at stake in the development of
 renewable energy sources throughout the world—not
 only as the biggest exporter of renewable energy
 technology, but if they do not favour RES they will
 also face intense competition for oil and gas resources
 from rapidly industrialising states in Asia and Latin
 America (European Commission, 2000). As non-OPEC
 reserves are expected to peak during the next decade or
 two, the resulting shift in power in favour of OPEC is
 likely to result in high oil prices. Such a price increase
 could on the one hand benefit nuclear and coal, but on
 the other hand could promote RES even more
 (Bechberger and Reiche, 2003; Lauber, 2002) (Table 9).

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