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COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

Green Paper follow-up action
Report on progress in renewable electricity

{SEC(2007) 12}

TABLE OF CONTENTS

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1. INTRODUCTION AND BACKGROUND

Renewable energies promise strategic improvements in the security of supply, reduce the long-term price volatility to which the EU is subjected as a price-taker for fossil fuels and could offer an enhanced competitive edge for the EU energy technology industry. In addition, renewable energies reduce air pollution and greenhouse gas emissions. They also facilitate improvement in the economic and social prospects of rural and isolated regions in industrialised countries and help meet basic energy needs in developing countries. The cumulative effect of all these benefits makes a robust case for renewables support.

According to Article 3(4) of Directive 2001/77/EC on electricity produced from renewable energy sources (RES-E) in the internal electricity market[1], the Commission shall assess to what extent Member States have made progress towards achieving their national targets and compliance with the target of a 21% share of electricity produced from renewable energy sources. This is the main objective of this report.

2. THE OVERALL PICTURE. WHERE DO CURRENT IMPLEMENTED POLICIES LEAD US?

The EU aims at having renewable sources provide 21% of the electricity generated in its 25 Member States by 2010. This target was established in the EU renewables Directive 2001/77/EC, which sets out differentiated national targets.

The renewable electricity Directive has been a historical step in the development of renewable electricity. It has been a main driving force behind new policies being implemented.

Since the last Commission report published two years ago[2], 50% additional renewable electricity (non-hydro) has been produced. With current policies and efforts in place, it can be expected that a share of 19% by 2010 will be reached. In other words, Europe will in all likelihood, come close to its target on renewable electricity by 2010. Large and small-scale hydro is still the largest renewable source in the electricity sector. It contributed to 10% of total electricity consumption in 2005. As hydro energy depends on drought or high amounts of rainfall, a normal rainfall year is used in this report to avoid the influence of climate factors. There are other renewable energy sources not described in this report as their current

[1] Directive 2001/77/EC of 27 September 2001 on the promotion of electricity produced from renewable energies sources in the internal electricity market (OJ L 283, 27.10.2001, p. 33).

[2] "The share of renewable energies in the EU" - COM(2004) 366.

penetration is not significant. But energies such as solar thermal electricity and wave and tidal will certainly have a role to play in the years to come[3].

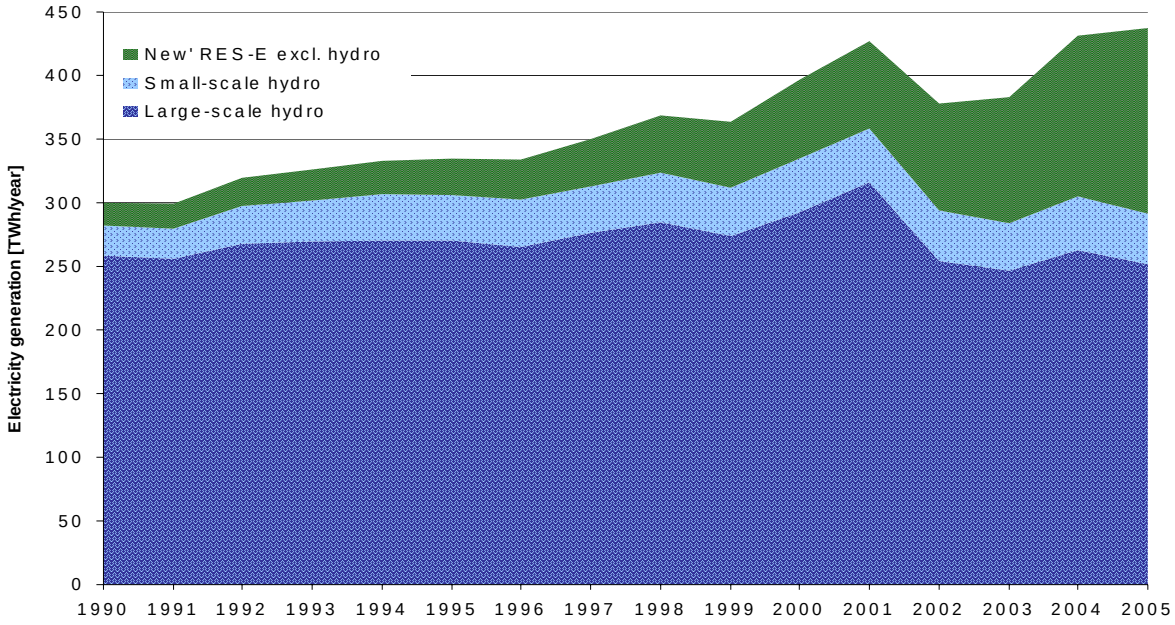

Figure 1: Historical development of electricity generation from total RES-E in the European Union (EU-25) from 1990 to 2005[4]

In 2005, renewable electricity contributed 15% to overall EU electricity consumption in the European Union[5]. This should be seen against a higher than expected level of overall electricity consumption in Europe. In the EU, electricity consumption is growing at 2% per year[6]. However, it should be noted that with the exception of Germany and Spain, the countries making good progress unfortunately represent only a relatively small proportion of the total EU market. In a number of Member States the share of renewable electricity is even declining.

Since 1990, new-RES have produced 148 TWh, which is the equivalent of the total electricity consumption of Ireland, Austria and Portugal.

The achievement can thus be characterised as positive due to serious efforts by a few active Member States, but overall not good enough with many Member States lacking far behind their national targets. More needs to be done if Europe wants to reverse the trend towards an increasingly unsustainable energy future.

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3 Spain has put in place 11 MW of large solar thermal power in 2006 and there are 65 MW under construction. To date only Portugal and United Kingdom are explicitly providing incentives for ocean energy systems. The large tidal range along the west coast of England and Wales provides some of the most favourable conditions in the world for the use of tidal power. In the Commission Green Paper towards a future Maritime policy in the Union - COM(2006) 275 -, wave, tidal, and off-shore wind energy are referred to as potential near future energies.

4 Source Eurostat until 2004. The year 2005 includes provisional figures from IEA and Member States.

5 2005 figures are provisional from IEA and Member States. Consolidated Eurostat figures give a 14% by 2004. Starting point for the Directive was 13%.

6 If EU-25 electricity consumption had been constant since 1997, the current share of renewable electricity would now be 16%.

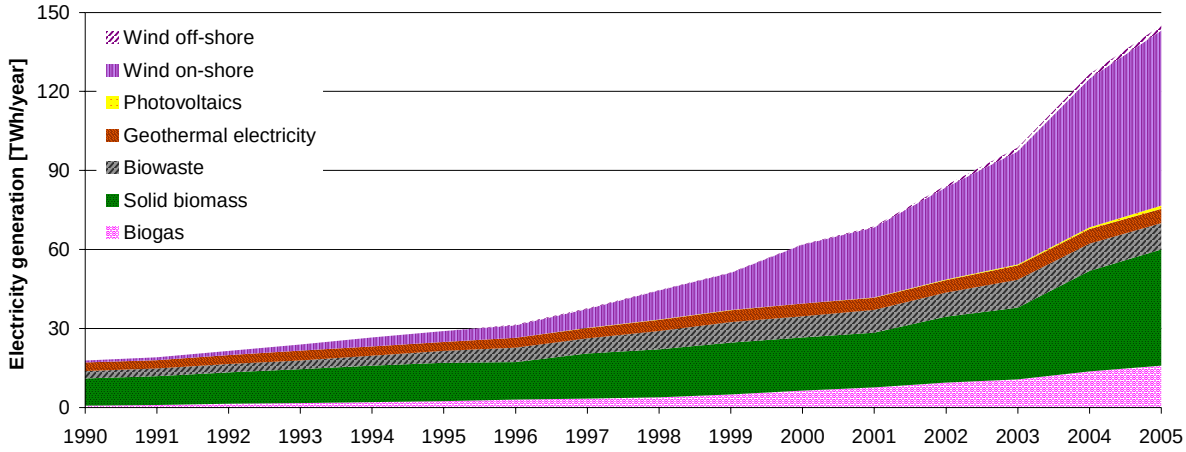

Figure 2: Historical development of electricity generation from 'new' RES-E in the European Union (EU-25) from 1990 to 2005[7].

3. ASSESSMENT OF PROGRESS AT THE NATIONAL LEVEL. MS EVOLUTION

Nine Member States are joining the club of those countries 'performing well' with some of them even reaching the target in advance. However, eleven Member States seem to fail to meet their national commitment.

The EU-15 Member States had to transpose Directive 2001/77/EC by October 2003. The 10 Member States that acceded to the EU on 1 May 2004 had to transpose it by the date of accession. Since the last report, a number of different policies have been put in place, Energy Acts have been adopted, and new regulations have been implemented.

In addition to the quantitative achievements in terms of generating electricity from renewable energies, this report shows Member States' achievements in adopting active measures to promote RES-E. Points to note on the methodology of this report are that market penetration of RES-E taken into account has been normalised[8], i.e. a normal rainfall year and a normal wind year are used to avoid the influence of climatic conditions (e.g. drought or high amounts of rainfall). Second, analysis is presented mainly as the percentage degree of achievement of the target. For example, a country will ideally have reached 40% of the target in 2004 and 50% in 2005[9]. Not all Member States have data for 2005, so data for both 2004 and 2005 are provided.

New elements in the support framework for 2005 and the first half of 2006 are also considered. In addition to official polices, the perspective of investors is also taken into account as it provides a good basis for assessing the viability of the renewable energy market in a country and the healthiness of the market[10]. According to the current status of market

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7 Source Eurostat until 2004. The year 2005 includes provisional figures from IEA and Member States.

8 The analysis of achievements is based on the Progress project "Analysis of the achievement of 2010 national and Community targets under Directive 2001/77/EC", and the EurObserv'ER project.

9 In general, the latest consolidated statistics are from 2004. Some Member States have presented 2005 figures, and the wind, PV and biogas statistics are well known for 2005. Biomass figures are provisional statistics from IEA. When available at Member State level, 2005 data are also taken into account.

10 Ernst &Young investment index Reference.

penetration achieved and policies implemented, Member States can be classified into five categories:

1. **Perfect: on track for meeting 2010 target** ☺☺

2. **Current developments provide a reasonable chance of reaching the 2010 target** ☺

3. **Additional effort needed to achieve the 2010 target** 😐

4. **Stronger additional efforts are needed in order to reach the 2010 target** ☹😐

5. **Far from commitment** ☹☹

A brief overview of the current situation in each Member State is provided below. Additional details are available in the country profiles.

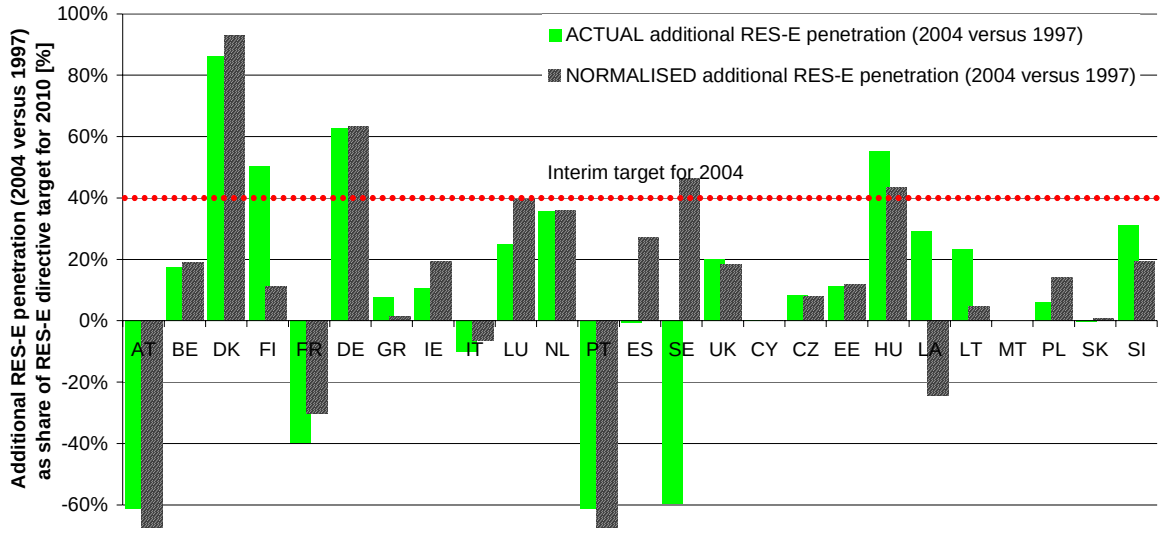

Figure 3: RES-E target achievement at country level: actual and normalised additional RES-E penetration (2004 versus 1997).

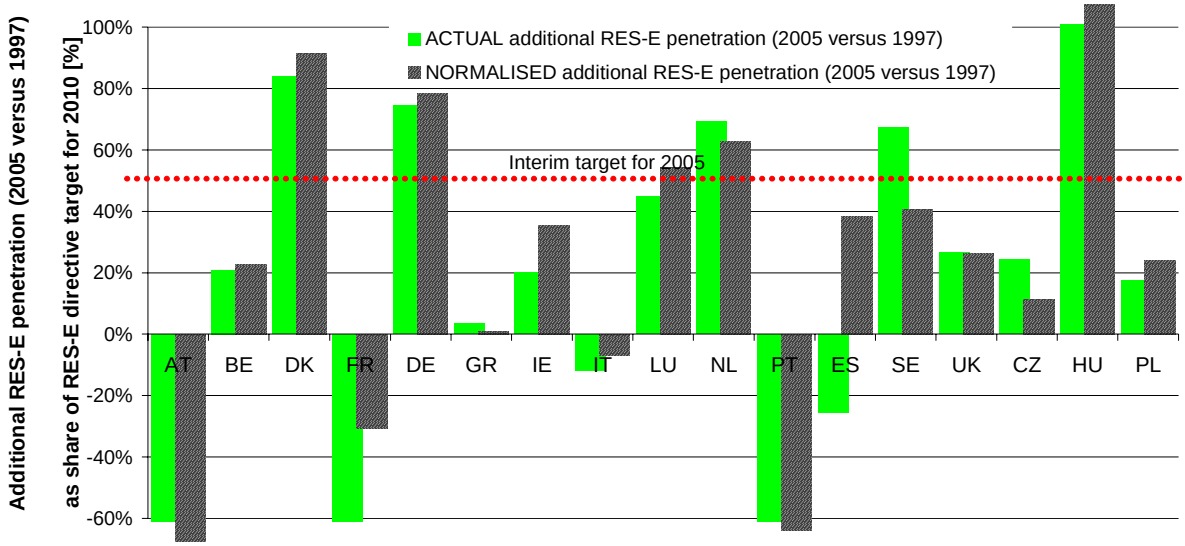

Figure 4: RES-E target achievement at country level in countries where 2005 data are already available: actual and normalised additional RES-E penetration (2005 versus 1997).

1. Perfect: on track for meeting the 2010 target ☺☺

Denmark. Strong growth of RES-E, especially wind energy. World leader in offshore wind energy. Assuming current growth continues, Denmark will easily exceed its target of 29 % in 2010. The target will possibly be met three to four years early.

Germany. Strong development of the renewable industry. New government continues the existing commitment to the RES-E market, thus maintaining market stability.

Hungary. Strong increase since 2004 due to solid biomass (co-firing). The 5.8% target for 2010 was achieved in 2005. The new measures planned by the government will probably result in 7.9% electricity by 2010[11], thus exceeding their target.

2. Current developments provide a good opportunity to reach 2010 target ☺

Finland. Produces around one quarter of its power from RES-E, with half from hydro and half from biomass. New policy emphasis is being placed on the increased use of local biomass resources.[12]

Ireland. Moderate increase in RES-E, mainly due to wind energy. The new feed-in support system is expected to provide more positive investment conditions than the previous tendering scheme, leaving Ireland in a good position to meet the 2010 target.

Luxembourg. Good RES-E deployment, especially in biogas and PV. The introduction of enhanced feed-in tariffs is expected to result into increased penetration of RES-E.

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11 Report on the status of electricity production based on renewable energy sources. Republic of Hungary, Minister of Economy and Transport, Budapest, February 2006.

12 High variability of hydropower together with an important share of this energy in Finland explains the difference between real and normalized percentages in Figure 1.

Spain. Strong increase in RES-E penetration mainly due to wind energy growth. Spain is the world's second producer of wind energy and has a good approach to incorporating high levels of intermittent wind capacity into the grid. However, the strong growth in electricity consumption overshadows the impressive level of renewable deployment.

Sweden. Strong biomass policy in the last few years with 3 TWh of solid biomass produced and 3 TWh more planned through biomass co-firing in existing plants. The new energy bill and policy horizon up to 2030 could sustain the good results of the recent years.

The Netherlands. Significant growth in RES-E, especially in biomass, due to the support system of feed-in tariffs and high oil prices. However, the indefinite freezing of financial support for large scale pure biomass and offshore wind in August 2006 may destabilise the market for RES-E initiatives. Greater certainty and support is needed to meet the 2010 target of 9%.

3. With additional efforts there is a good chance of reaching the 2010 target 😐

Czech Republic. Modest progress in RES-E due to uncertainty of financial support. The revised support scheme is expected to provide greater support from 2006 onwards. Faster growth is needed in order to reach the RES-E target of 8% in 2010.

Lithuania. Progress up to now has been modest. Amendments made in 2005 to the RES-E support system must lead to tangible results soon in order to reach the 2010 target of 7%.

Poland. The low green certificate prices together with the lack of penalties for non-compliance have led to a very modest increase in RES-E. Biomass and wind are taking off slowly. Due to increased quota obligations, higher certificates prices and faster growth of RES-E are expected from 2007 onwards.

Slovenia. High annual electricity demand growth in consumption (4.5%) is overshadowing the modest increase in RES-E. However, the support scheme puts Slovenia in a good position to reach its 2010 target of 33.6%.

United Kingdom. Some progress is visible, especially on biogas but government policy on renewables has to change in order to reach 2010 target.

4. Strong additional efforts needed in order to reach 2010 target ☹😐

Belgium. Modest growth. The quota obligation has triggered a considerable increase in green certificates. However, translation into generation of RES-E has been modest. More effort is needed to reach the 6% target.

Greece. Modest growth in RES-E, mainly due to administrative barriers, although recently a new regulation was adopted aiming at lowering these barriers. The recent significant growth in wind energy (1000 MW installed by 2005) gives a positive push for the RES-E market. Stronger increases in RES-E are needed to reach the 2010 target of 20.1%.

Portugal. Good progress since 2004. The government is currently tendering a proposal for a 1 500 MW wind farm. Nevertheless, strong efforts are needed to reach the 2010 target, together with efforts to restrain electricity demand.

5. Far from commitment ☹☹

Failure or slowness on the correct implementation of the RES-E directive is often demonstrated by the seriousness with which targets are being pursued. Slow growth in RES-E is often the result of planning delays and administrative barriers, restricted grid access (subjective, opaque and discriminatory rules for grid connection and reinforcement) and financing reasons.

Austria. The production of renewable energy is dominated by large-scale hydropower (60% of total electricity consumption). Over recent years, there has been considerable growth in capacity in the wind, and biomass sectors due to favourable feed-in tariffs. However, there are currently poor investment conditions due to a revised support scheme, leading to stagnating RES-E development.

Cyprus. Virtually no RES-E deployment. A new feed-in tariff scheme started in 2006.

Estonia. An increase in hydropower and biomass has led to modest growth in RES-E. However the current support scheme does not seem adequate to develop other sources such as wind.

France. No visible results of additional RES-E penetration up to now. The tender scheme for biomass RES-E has been postponed again. Improvements in administrative procedures might lead to better results in the future.

Italy. The quota obligation implemented in Italy has led to some new RES-E deployment in the past. However, this has been completely offset by the growth of gross electricity consumption. There is a large gap between current RES-E penetration and the 2010 target of 25%. Administrative problems persist as one of the major barriers to growth in a country with high potential for renewable energy sources.

Latvia. RES-E deployment is very modest due to the lack of a stable support system.

Malta. Virtually no RES-E deployment. No RES-E strategy has been implemented.

Slovak Republic. Poor progress of RES-E. Much stronger support is needed in order to reach the 2010 target of 31%.

It is impossible to isolate the discussions of target achievement from the **level of support**. The support for RES electricity varies significantly among the EU Member States. The previous Commission report on the support of electricity from renewable energy sources[13] gave a detailed assessment of the differences. Wind is poorly supported in nine of the twenty-five Member States. Where the total support received by producers is lower than generation costs, no take-off of renewable energies can be expected. For biomass forestry, half of the Member States do not give enough support to cover generation costs. In the case of biogas, in nearly three quarters of the Member States, support is not sufficient for deployment.

[13] Communication from the Commission on the support of electricity from renewable energy sources - COM(2005) 627, 7.12.2005.

The discussions of support schemes should also be linked to the issue of administrative barriers. To meet RES-E penetration targets in a cost-effective way, it is necessary to create a process that will facilitate increased RES-E generation in a timely and simple manner.

4. DEVELOPMENT OF ELECTRICITY IN THE DIFFERENT RENEWABLE SECTORS: WIND, BIOMASS, HYDRO, GEOTHERMAL AND SOLAR ENERGY

Hydropower remains the dominant source[14], but new renewable sources such as wind or biomass are starting to play a role. Large hydro is a well established technology with a nearly saturated potential in EU-25. For that reason it is not considered under this analysis.

4.1. Wind. Enlarging the group of three leaders and going for a global market

The European Union remains the global leader in wind power with 60% world market share. The global wind power market is growing strongly, with significant Asian market growth (especially from India) and a strong increase in the rate of North American installations[15]. In 2002, 80% of world capacity was installed in Germany and Spain. In 2005, this share was 56%. The slow down in the impressive yearly growth in Germany was counterbalanced by the rise in other European markets such as those of the United Kingdom, Portugal[16], and Italy.

Since 2000, wind power capacity has increased by more than 150% in the EU. The amount expected in the White Paper on renewable energies[17] of 40,000 MW was reached five years ahead of schedule. Total wind installed capacity of 40,455 MW produced 82 TWh in 2005. The excellent performance of the wind sector has enabled the industry to upgrade its target to 75,000 MW in 2010.

New wind power represents 33% of the new electricity generating capacity in the EU. The remaining 67% is mainly conventional thermal power stations. RES-E from wind constitutes 2.6 % of total European Union electricity consumption, the equivalent of the electricity consumption of Denmark and Portugal together. Average annual growth of electricity produced from wind has been 26% over the past five years.

As mentioned in the Commission Communication of December 2005[18] one third of EU countries do not give enough support to wind energy. In half of the EU Member States, wind is not sufficiently harnessed. The main cause of this slow development is not deliberate policy but delays in authorisations, unfair grid conditions and slow reinforcement and extension of the electric power grid. These continue to pose a threat to the future growth of wind energy.

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14 Hydropower (small and large) produced 67% of the total renewable electricity in 2005.

15 Renewal of the American Production Tax Credit (PTC) scheme until 2007 has reassured US investors who installed more than 2,400 MW in 2004. The European Union installed 6,165.7 MW in 2005.

16 Portugal has become the 7th EU country to pass the 1,000-MW mark with a total cumulated installed capacity of 1,021 MW at the end of 2005. Portugal practically doubled its installed capacity in one year by adding 500 MW. These very good results are due to the lifting of administrative barriers and a very attractive purchase price system.

17 Communication from the Commission "Energy for the future: renewable sources of energy, White Paper for a Community Action Plan - COM(97) 599, 26.11.1997.

18 Communication from the Commission on the support of electricity from renewable energy sources - COM(2005) 627, 7.12.2005.

The industry has set a new target of 75,000 MW by 2010. This capacity would provide approximately 160 TWh, representing between 4% and 6% of the 2010 European electricity consumption. For this deployment to be achieved, the club of countries "performing well" must be enlarged. The offshore market will most certainly be a key element in wind energy development in the next few years.

Integration of major shares of wind power in the grid can be tackled. For example, in 2005, wind power delivered 18% of Danish electricity demand.

The European wind energy industry has kept pace with the growth of the global market. German and Spanish industrialists are becoming less and less dependent on growth in their own domestic markets, with increasing shares for export. Denmark has been able to maintain the number of wind power sector jobs at 20 000 due to its export market. According to the BWE (German Wind Energy Association), the German wind energy industry boasted a €5.03 billion turnover in 2005. Half of this figure, i.e. €2.51 billion, is the turnover for exports. The situation is identical when it comes to jobs, with exports now accounting for 31 900 of the 63 800 jobs in the German wind power industry.

The growth of the global wind energy market has been accompanied by a phase of industrial reorganisation of the sector. This reorganisation has deeply modified the wind power industrial situation since 2002. There has been considerable industry consolidation, with fewer, larger players, particularly in the global market. Medium and smaller sized firms still play a role, though, at a more regional market level.

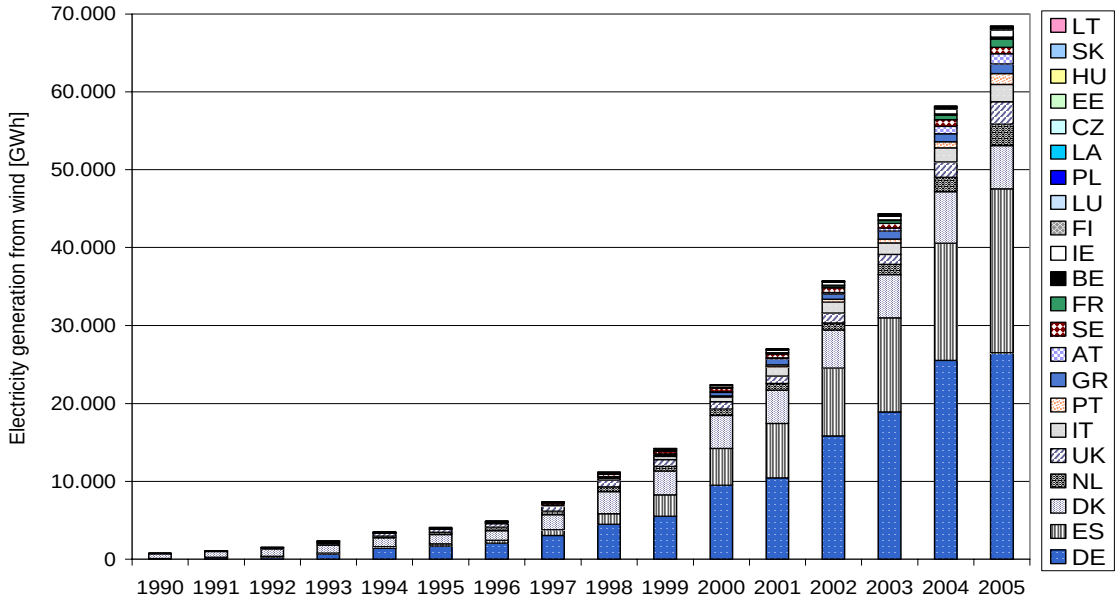

Figure 5: Historical development of electricity generation from wind in the EU-25 Member States from 1990 to 2005[19].

[19] Source Eurostat until 2004. The year 2005 includes provisional figures from IEA and Member States.

4.2. Biomass

Three fuel types contribute to the total biomass electricity generation: solid biomass, biogas and the biodegradable fraction of municipal solid waste. Further details are given on solid biomass and biogas. Biomass electricity constitutes 2% of the total EU electricity consumption. Total biomass grew by 18% in 2002, 13% in 2003, 19% in 2004 and 23% in 2005[20]. Clearly progress has accelerated significantly over recent years. If the growth rate of 2004 could be extrapolated to 2010, total biomass contribution would reach about 167 TWh, which corresponds to the generation needed from biomass to fulfil the 21% target of electricity from renewable energy[21]. But 2005 biomass contributions from the Netherlands risk being only a short term success[22].

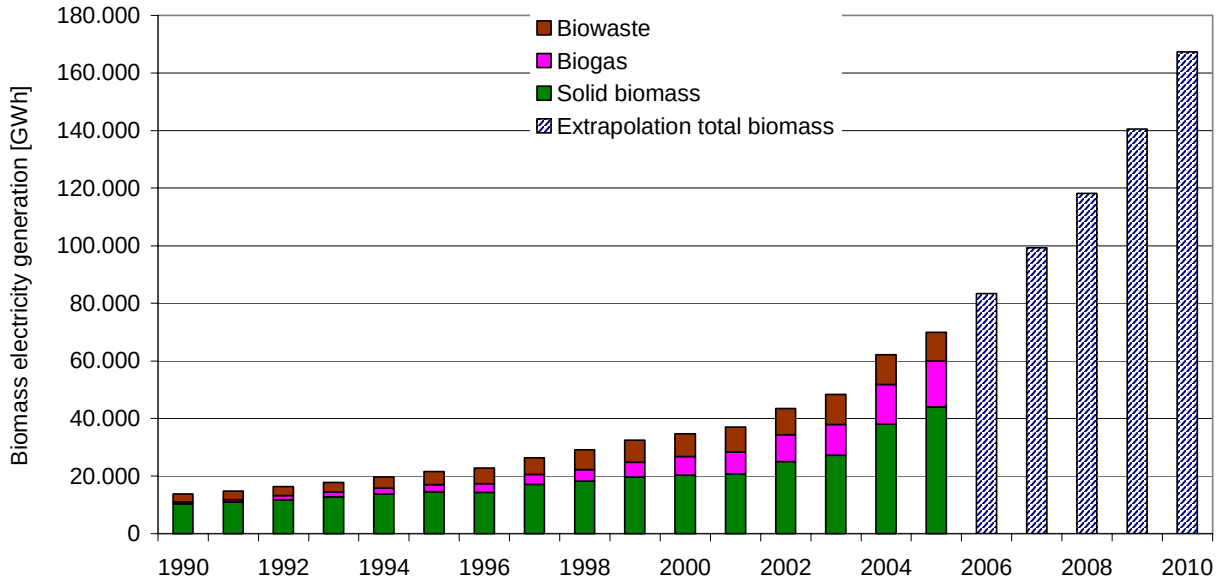

Figure 6: Historical development of electricity generation from solid biomass, biogas and municipal solid waste in the EU-25 Member States from 1990 to 2004 and extrapolation to 2010 assuming a yearly growth rate of 19%[23].

4.2.1. Solid biomass

Electricity from solid biomass is generated based on the combustion of forestry and agricultural products and residues in thermal power stations. As with the progress of total biomass, the development of solid biomass accelerated significantly in 2004 and 2005. Annual growth rates in recent years amounted at EU-25 level to 20% in 2002 13% in 2003 and 25% in 2004.

The development in EU-25 is shown in Figure 7. Between 2002 and 2004 about 10 TWh additional generation was added to the electricity network. The largest contributors to total

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20 2005 contain provisional figures from IEA.

21 Provided that total biomass contributes to 40%, wind energy 50% and all other RES-E 10% of the additional RES-E generation until 2010 compared to 2001. Please see COM(2004) 366 for clarification of these estimations.

22 Biomass support system has been frozen by the Dutch government. Sweden success in biomass comes from existing power plants and not from newly developed capacity.

23 Source Eurostat until 2004. The year 2005 includes provisional figures from IEA and Member States.

biomass RES-E generation are Finland and Sweden followed by Germany, Spain, the United Kingdom, Denmark, Austria and the Netherlands.

Infrastructure barriers to further growth are more important than economic ones. The Biomass Action Plan[24], aiming to increase biomass use, addresses the problems perceived in the present biomass markets in Europe. It also sets out a coordinated programme for Community action. These measures include improving the supply of and demand for biomass; overcoming technical barriers; and developing research and development.

Certainly the long term traditions in the biomass sector and the importance of the forestry industry, together with the fact that most plants are large scale industrial units operating in combined heat and power (CHP) mode, are strong factors supporting the development of the biomass electricity sector in Nordic countries. The development in Germany is mainly driven by medium scale generation units up to 20 MW, whereas due to specific support for CHP, an increasing share of biomass plant is operated in cogeneration mode.

Almost half of the Member States allow co-firing of solid biomass in conventional power plants. As can be seen especially from the British and Hungarian example, this option allows particularly high growth rates. In the UK, biomass electricity generated by co-firing processes clearly dominated the total electricity generation by solid biomass in 2004 and grew by almost 75 % (+1,4 TWh) in 2005. Currently, 630 000 tons of biomass are used as fuel in the three biggest co-firing plants in Hungary.

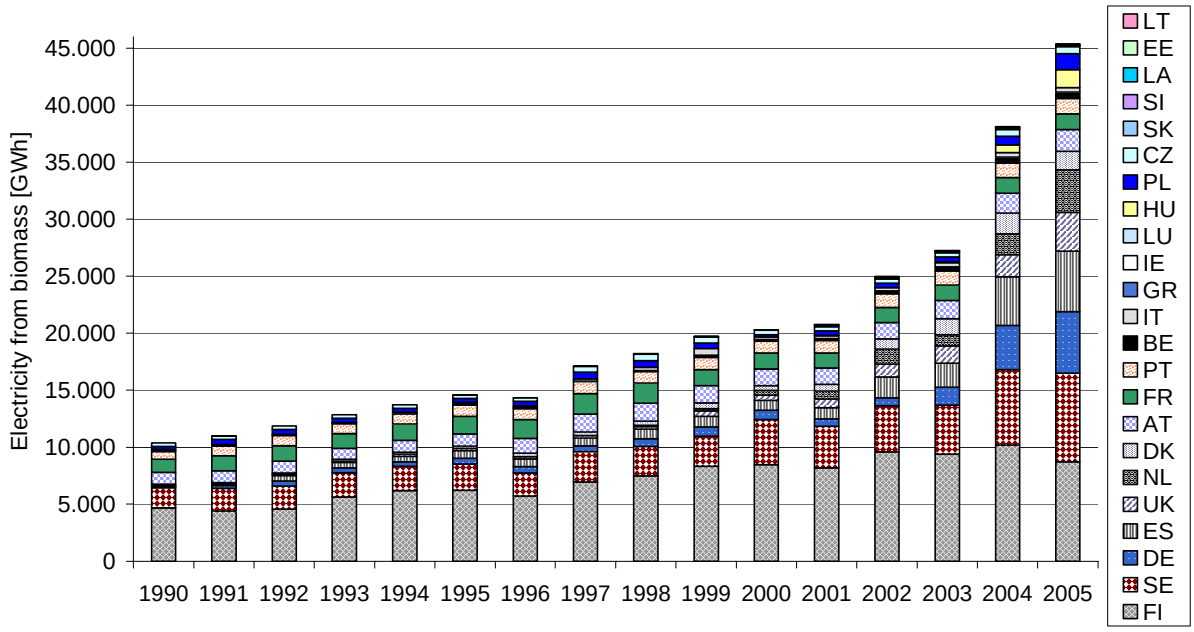

Figure 7: Historical development of electricity generation from solid biomass (excluding municipal solid waste) in the EU-25 Member States from 1990 to 2005[25].

The Commission has just approved and presented an EU Forest Action Plan to the Council and the European Parliament[26]. This Action plan supports inter alia the use of forest resources

24 Communication from the Commission on the Biomass Action Plan - COM(2005) 628.

25 Source Eurostat until 2004. The year 2005 includes provisional figures from IEA and Member States.

26 Communication from the Commission on an EU Forest Action Plan, European Commission 2006 - COM(2006) 302.

as an energy feedstock. This will be particularly important for the production of solid biomass.

4.2.2. Biogas

With oil prices and natural gas prices currently so high, it is a waste to produce biogas and then just see it simply flared into the air. In 2005, nearly 5 Mtoe were produced in this way for energy uses in the different countries of the European Union. The total resource is estimated at more than 20 Mtoe with current waste production. Energy exploitation of biogas is not only a question of energy production but a question of waste treatment and environmental considerations. About half of European waste is simply landfilled.

Approximately two thirds of biogas is used for electricity production and one third for heat production. Electricity production from biogas is estimated at 14.9 TWh in 2004. Half of this electricity is obtained through CHP plants.

Biogas results from several different types of processes. It can come as captured landfill gas formed from biodegradable waste in rubbish dumps – not very efficient from an environmental perspective – or can be produced via a digester. Treatment depends on the kind of waste involved. Biogas can be made from household refuse or, agricultural waste, such as liquid manures and crop harvest waste. Biogas can be treated in small single farm-scale biogas units or collective and centralised units. These units, principally developed in Denmark, are capable of treating different types of waste at the same time, principally manure and liquid manure mixed with various other organic wastes. Dedicated bio-gas plants are an efficient way of handling bio-waste from agriculture and industry, and the size of these plants also allows for effective use of the energy content of the waste. There is considerable potential for growth of this technology.

Annual growth rates for biogas electricity generation have been high for the last decade and amount to 24% in 2002, 13% in 2003, 22% in 2004 and 15% in 2005.

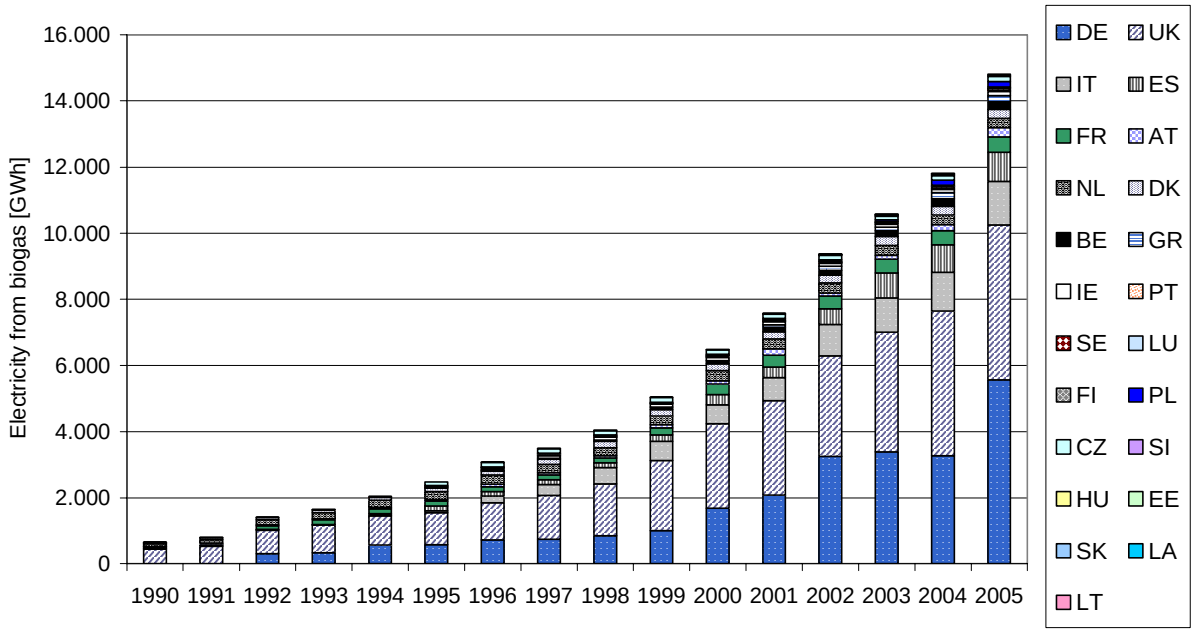

Figure 8: Historical development of electricity generation from biogas in the EU-25 Member States from 1990 to 2005[27].

The reinforcement of European environmental regulations concerning limitations and taxation of landfill is encouraging decision-makers to find more energy and climate friendly solutions to treat organic waste as soon as it is collected. However, about half of European municipal waste is still landfilled which means a dumping of waste and precious energy.

Apart from heat and electricity production, biogas can also be used as a transport fuel. Sweden already has 779 buses running on biogas, more than 4 500 cars using a fuel composed of a mixture of petrol and biogas or natural gas, as well as a train operating in this way since last year.

One quarter of EU countries give sufficient support to biogas development.

4.3. Photovoltaic solar energy

Total installed PV capacity in the EU has been growing at an unprecedented average annual growth rate of 70% over the last five years, from 127 MWp[28] in 2000 to 1,794 MWp at the end of 2005. The impressive growth of the total installed capacity in Europe is driven by Germany: 86% of currently installed PV capacity in the EU is in Germany. The other European markets have a completely different dimension. The Netherlands has over 50 MWp installed and Spain 58 MWp. Another indicator, the "peak power per capita" ratio of the EU 25 Member States , is also rising markedly. It rose from 2.5 Wp per inhabitant in 2004 up to 3.9 Wp per inhabitant in 2005. For comparison: Japan (128 million inhabitants) has an installed capacity of 8.9 Wp/inhabitant, while the USA (291 million inhabitants) has an installed capacity of 1.3 Wp/inhabitant.

PV is mainly a decentralised technology. When installed on the roofs of buildings, its electricity has the advantage of providing two times the level of primary energy, due to conversion losses in thermally based electricity production plus savings in transmission and distribution losses. This sector has a high technology component, a modular nature and a high long term potential[29].

4.4. Small-scale hydro

The current European trend in terms of the progression of small plant capacity is not a very dynamic one, due to administrative and environmental barriers. Nevertheless, the sector has a real potential which can generate steady and buoyant economic activity.

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27 Source Eurostat until 2004. The year 2005 includes provisional figures from IEA and Member States.

28 Normally capacity of solar PV is expressed in watt peak (Wp). It is the Direct Current Watts output of a solar module as measured under an industry standardized conditions. This conditions are illumination of 1000 Watts/m², 25°C ambient temperature and a spectrum that relates to sunlight that has passed through the atmosphere (AM or Air Mass 1.5).

29 A good example of innovative policies to further support PV has been introduced by Spain, which was the first country in Europe to adopt a national obligation for buildings to take measures on energy efficiency and on the minimum use of solar energy (solar thermal or PV) in new buildings or in buildings being remodelled. An obligation of a minimum contribution of PV to total electricity supply for new buildings in the tertiary sector with a surface area above a specific number of m² exists.

The term "small-scale hydro" refers normally to hydro power plants with a capacity of up to 10 MW. In other regions of the world, the power threshold that divides “large” and “small” hydraulic plants can be very different. For example, all installations of less than 50 MW come under the heading of small hydraulic in China. This renewable energy source is characterised by considerably differing potentials and electricity generation costs throughout Europe.

Small-scale hydro capacity grew annually by 3.8 % on average during the last four years in the EU-25. The main reasons for the slow development are in particular exploited potentials and high administrative barriers (e.g. environmental permits). As compared to the situation in the EU-15, the Member States that acceded to the EU in May 2004 have shown a more dynamic development of this sector, mainly due to the development in Slovenia and Poland. The EU-10 showed higher growth rates of almost 8 % between 2000 and 2004.

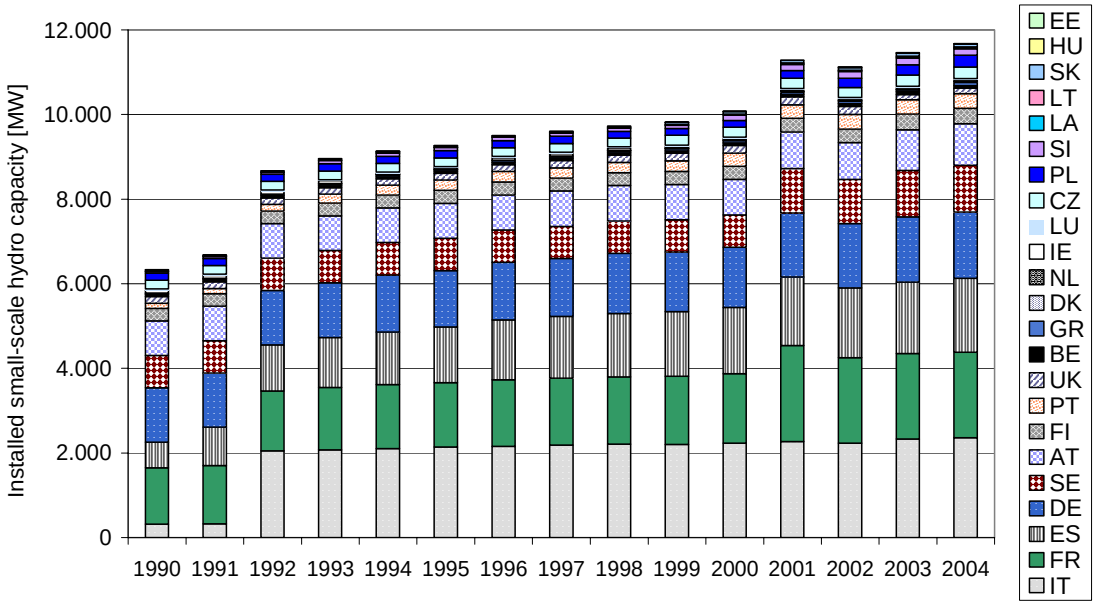

Figure 9 : Historical development of installed small-scale hydro capacity in the EU-25 Member States from 1990 to 2004[30].

4.5. Geothermal energy

Worldwide, the geothermal sector is currently the fourth largest electrical power production sector using renewable energy sources, ranked behind hydraulic power, biomass and wind power. At the end of the year 2004, it represented 8911 MW worldwide installed. Europe has 9 % of worldwide geothermal capacity.

However, the large geothermal uses in Europe are not in the electricity sector but in heating use with a large majority being exploited in the building sector through geothermal heat pumps[31].

In the EU, electricity production from geothermal sources is currently mainly used in Italy, Portugal (Azores) and France. The undisputed European leader is Italy, with a total installed capacity of 790 MWe, which is over 95% of all installed capacity in the EU-25. Apart from

30 Source: Eurostat.

31 In Europe, geothermal capacity is 6,589.8 MWth (including 4,531 MWth of heat pumps).

these leading countries, new developments can be observed in Austria and Germany with binary cycle technology producing electricity and heat at the same time.

The heat pump industry is by far the most dynamic of the geothermal sectors but the heat applications are beyond the scope of this Commission report. The evolution of geothermal electricity would considerably depend on the possibilities of producing heat and electricity at the same time.

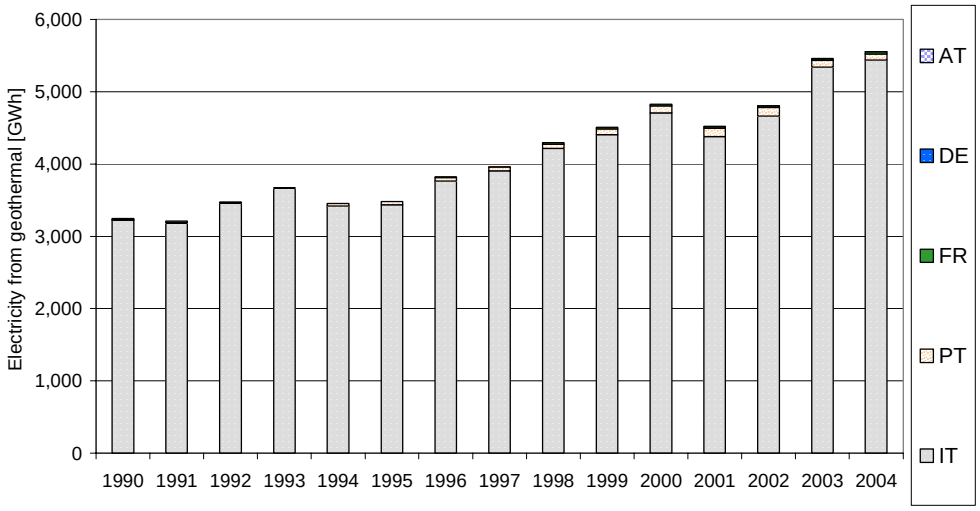

Figure 10 : Historical development of electricity generation from geothermal sources in the EU-25 Member States from 1990 to 2004[32].

5. LEGAL IMPLEMENTATION OF THE DIRECTIVE

The Directive, with its objective of increasing the contribution of renewable energy sources to electricity production, covers four main areas: setting of national indicative targets for the consumption of electricity from renewable energy sources; streamlining administrative procedures for new RES producers; ensuring fair treatment for RES producers seeking connection to the national electricity grid; and establishing mutually recognised guarantees of origin for electricity from renewable energy sources. In addition, Member States and the Commission are required to report on progress towards achieving the national indicative and overall EU target for the share of renewable electricity consumption.

Article 3(1) allows the Commission to control whether Member States have taken appropriate steps to achieve their national indicative targets[33].

All Member States have formally transposed the Directive, which implies that Member States have, as a minimum, put in place primary legislation covering the main provisions of the Directive. In several Member States a complete transposition also requires secondary legislation.

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32 Source: Eurostat.

33 "Member States shall take appropriated steps to encourage greater consumption of electricity produced from renewable energy sources[…] These steps must be in proportion to the objective to be attained".

The degree of correct transposition and implementation of the Directive varies between Member States. The Commission has initiated infringement proceedings against Austria, Cyprus, Greece, Ireland, Italy and Latvia. The main basis for these infringement proceedings is summarised in the following table:

Requirements	Reasons for infringement proceedings
Article 9 – General transposition- Laws, regulations and administrative provisions.	Incomplete transposition due to lack of secondary legislation
Article 3 – Target setting and appropriate measures to increase share of renewable electricity	Lack of commitment concerning target
Article 5 – Guarantee of Origin	A system of guarantees of origin has not been fully implemented
Article 6 – Administrative procedures	Complex, non-transparent and/or discriminatory authorisation procedures for issuing licences for building and operating renewable electricity plants.
Article 7 – Grid access conditions	Opaque and discriminatory conditions regarding access to grid and regarding rules for cost sharing/bearing of various grid investment (connection, extension and reinforcement) costs.

Infringement proceedings concerning Directive 2001/77/EC are initiated either on the basis of complaints received by the Commission, or by the Commission on the basis of the reports from Member States or other information concerning renewable electricity developments made available to the Commission services.

6. CONCLUSIONS AND FUTURE ACTIONS

A trend now emerging across the European Union is an increasing awareness of the three main drivers of renewable energy: sustainability, competitiveness and security of supply[34]. The industry has historically been driven by "top down" incentives such as subsidies and fiscal measures that are designed to achieve macro-economic and environmental objectives. However, renewable energy demand is becoming an increasingly important "bottom up" driver for the industry. Rising power prices are forcing consumers to consider different power procurement strategies. Energy demand would continue to rise if energy efficiency measures are not actively implemented. Electricity costs increased on average by 40% between 2004 and 2005 with commercial and industrial consumers hit the hardest.

[34] Communication from the Commission A European Strategy for sustainable, competitive and secure energy - COM(2006) 105, 8.3.2005.

Renewable energy producers have become important players on the electricity markets. There is a need for the proper integration of renewable energies in the electricity internal market. The principle of third party access is fundamental to allow investments in renewable energies to feed into the grid and to attract new investors to the market. The operation and the investment in renewables based generation are more efficient when renewable energies are exposed to market price signals. The internal market allows pooling of generation thus providing efficiency gains for both large scale and small scale renewable production. Cross border trade allows electricity to be sold from an area with a surplus to a wide customer base, or electricity to be imported from a greater distance. This is particularly important for areas with a high density of wind generation.

Renewable energies can also provide a hedge against electricity market volatility. Europe cannot afford to fail on its renewable energy policy.

Some Member States – Denmark, Germany, Spain, Ireland, Hungary, Netherlands and Luxembourg – seems to meet the targets they have accepted under the directive. It is mainly due to the efforts of these few countries that the EU may at best achieve a share of 19% of renewable electricity in 2010. Other Member States may achieve their national targets if they strengthen their policies. But a significant number of Member States display decreasing shares of renewable electricity production.

Wind energy is a clear success with strong European growth and a growing global market. Biomass – the sleeping giant – is starting to wake up, and biogas and co-firing sources have also increased in the last two years. With the current policies in place, the overall share of renewable electricity will reach 19% by 2010.

Coming this close to achieving the target can be considered a partial success, although there is still significant scope for improvements. The Commission wants to continue the effort to achieve a sustainable trend in electricity, and recommends the following actions.

Eight main areas of action on renewable electricity must be immediately developed:

1 Member States must correctly and fully implement the Directive on renewable electricity.

2. Immediate lifting of administrative barriers, unfair grid access and complex procedures is necessary.

3. Optimisation of the support schemes as defined in COM(2005) 675 must occur. The Commission will re-examine, in 2007, the situation concerning Member States´ support systems for renewable energies with a view to assessing their performance and the need to propose harmonised support schemes for renewables in the context of the EU internal electricity market. While national schemes may still be needed for a transitional period until the internal market is fully operational, harmonised support schemes should be the long term objective.

4. To wake up the biomass sector through the actions in the Biomass Action Plan. Special attention shall be given to increasing of the use of biomass for CHP.

5. Credibility in the long term: the Commission will propose in 2007 a new legal framework for the promotion of renewable energy sources as set out in the Renewable Energy Roadmap.

6. The Commission will continue to co-operate closely with grid authorities, European electricity regulators and the renewables industry to enable better integration of renewable energy sources into the power grid and will pay particular attention to the special requirements related to much larger deployment of off-shore wind energy, notably as regards cross-border grid connections. Opportunities provided by the TEN-E scheme should be examined. Work should begin on a European offshore super-grid.

7. The internal electricity market shall be developed in a manner consistent with the development of renewable energies. Liberalisation, in particular concerning transparency, unbundling and higher inter-connectors capacity, also offers the opportunity for new innovative players to enter the market.

8. Renewable energies should be speedily integrated into the Lisbon strategy of the European Union through the competitiveness and innovation programme (CIP), regional and cohesion funds, rural development and reinforced RTD in the period 2007-2013.

ANNEX[35]

Assessment of Member States' progress towards the 2010 target (%)

	Reference year (1997 or 2000)	Achieved penetration 2004/2005	Normalised penetration 2004/2005	Objective by 2010	Classification
Denmark	8.7	25.8 (2005)	27.3 (2005)	29.0	☺☺
Germany	4.5	10.4 (2005)	10.8 (2005)	12.5	☺☺
Hungary	0.7	4.4 (2005)	4.0(2005)	3.6	☺☺
Finland	24.7	25.0 (2005)	25.4(2005)	31.5	☺
Ireland	3.6	6.1(2005)	8.0 (2005)	13.2	☺
Luxembourg	2.1	3.6 (2005)	4.0 (2005)	5.7	☺
Spain	19.9	17.2 (2005)	21.6 (2005)	29.4	☺
Sweden	49.1	53.2 (2005)	52.0 (2005)	55.2	☺
The Netherlands	3.5	6.9 (2005)	6.5 (2005)	9.0	☺
Czech Republic	3.8	4.8 (2005)	4.0 (2005)	8	😐
Lithuania	3.3	3.7 (2004)	3.3 (2004)	7	😐
Poland	1.6	2.8 (2005)	3.2 (2005)	7.5	😐
Slovenia	29.9	29.1 (2004)	29.4 (2004)	33.6	😐
United Kingdom	1.7	4.1 (2005)	4.2 (2005)	10.0	😐
Belgium	1.1	1.8 (2005)	1.9 (2005)	6.0	☹
Greece	8.6	9.1 (2005)	7.7 (2005)	20.1	☹
Portugal	38.5	14.8 (2005)	28.8 (2005)	39.0	☹
Austria	70.0	54.9 (2005)	57.5 (2005)	78.1	☹☹
Cyprus	0.0	0.0 (2004)	0.0 (2004)	6	☹☹
Estonia	0.2	0.7 (2004)	0.7 (2004)	5.1	☹☹
France	15.0	11.0 (2005)	14.2 (2005)	21.0	☹☹
Italy	16.0	15.3 (2005)	16.0 (2005)	25.0	☹☹
Latvia	42.4	47.1 (2004)	43.9 (2004)	49.3	☹☹

[35] Romania and Bulgaria have set up a target by 2010, maintaining the objective for the enlarged Union at 21%. Romania has set up a target for passing from 28% to 33% by 2010 and Bulgaria from 6% to 11% by 2010. Next Commission report in 2008 will consider the degree of achievement of their national targets.

Malta	0.0	0.0 (2004)	0.0 (2004)	5	☹☹
Slovak Republic	17.9	15.4 (2005)	14.9 (2005)	31	☹☹
EU-25	12.9	13.7 (2004)	14.5 (2004)	21.0	