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The Renewable Energy Progress Report

Accompanying document to the

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

The Renewable Energy Progress Report

Commission Report in accordance with Article 3 of Directive 2001/77/EC, Article 4(2) of Directive 2003/30/EC and on the implementation of the EU Biomass Action Plan COM(2005) 628

{COM(2009) 192 final}

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1. Introduction 3
2. The electricity sector 3
2.1 Support Schemes 5
2.2 Administrative barriers and grid access 7
2.3 Guarantees of Origin 10
2.4 Member State progress towards the 2010 targets 11
3. The transport sector 15
3.1 Progress in the use of biofuels and other renewable fuels 16
3.2. Support schemes 18
3.3. Economic impacts 27
3.4. Environmental impacts 31
3.5. Further measures needed in the transport sector 35
4. The implementation of the biomass action plan 37
4.1. Availability of biomass 38
4.2. Actions taken to increase the availability and use of biomass 38
4.3. Barriers to the uptake of bioenergy 40
4.4. Implementation of the thirty-three actions of the Biomass Action Plan 41
Annex A: Member States' support schemes for electricity from renewable energy sources. .. 45
Annex B: Review of the progress in different renewable electricity technologies 53
Annex C: Biofuel Energy Share 59
Annex D: 2nd-generation biofuel facilities in Europe 60

1. INTRODUCTION

This document accompanies COM(2009)XXX which outlines the progress the European Union is making developing renewable energy. The Communication recalls the European policy framework for renewable energy[1]: the importance of renewable energy for meeting our climate change and sustainability objectives, improving the security of our energy supply and developing an innovative European renewable energy industry to generate jobs and wealth for Europe.

This document provides the background material and analysis supporting the results presented in the Communication. It provides a summary of the detailed analysis undertaken for or by the Commission which explored the rate of progress and barriers to further growth in renewable energy and the impacts of biofuels in transport, as required under Directive 2003/30/EC[2].

2. THE ELECTRICITY SECTOR

There are well recognised reasons for increasing the share of electricity from renewable energy sources in the European Union. It will improve energy security, mitigate greenhouse gas emissions and regional and local pollutants from the power sector and it will increase the European Union's competitiveness in renewable energy technologies. For these reasons, the European Union set a target to source 21% of electricity from renewable energy sources by 2010[3]. Each Member State has a national indicative target for electricity from renewable energy sources to contribute towards the overall target. Member States are free to choose their preferred support mechanism in order to achieve their target. Directive 2001/77/EC[4] further stipulates that Member States must improve their grid access for renewable energy generators, streamline and facilitate authorisation procedures and establish a system for guarantees of origin.

Under Article 3 of Directive 2001/77/EC, Member States are required to publish a biannual report analysing progress against their national indicative target. This Communication assesses the extent to which Member States have made progress towards achieving their national indicative targets, ensuring that their effort is consistent with the 21% indicative share of electricity produced from renewable energy sources in total Community electricity consumption by 2010.

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1 As part of the new energy and climate change policy, the Commission proposed a new, more rigorous framework to drive forward the development of renewable energy and the need for more solid, legally binding targets for 2020. The new legislation covers all renewable energy and set new targets for 2020 to ensure a stable regulatory framework for the decade ahead. This new Renewable Energy Directive has now been agreed. In parallel to the development of the legislative framework, the Commission modified the Community Guidelines on state aid for environmental protection (OJ C 82, 1.4.2008, p.1); the new Guidelines entered into force in April 2008. Furthermore, under certain conditions, aid can be block exempted due to the adoption in July 2008 of the General Block Exemption Regulation (OJ L 214, 9.8.2008, p.3). For national support measures which constitute State aid in the meaning of Article 87(1) of the EC Treaty, these rules establish the conditions under which Member States can grant financial support for the promotion of energy from renewable energy sources

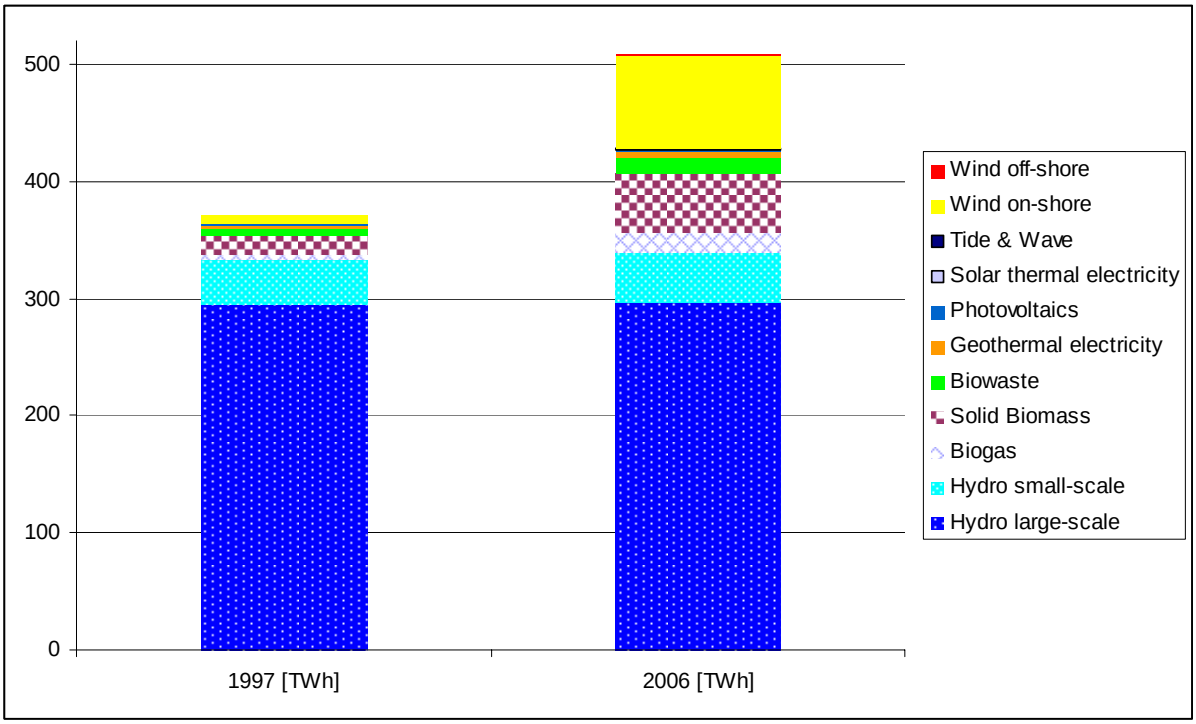
2 http://ec.europa.eu/energy/res/legislation/doc/biofuels/en_final.pdf
Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport

3 This target was set in Directive 2001/77/EC at 22.1% and was realigned to 21% in 2004 when the 10 new Member States joined the EU. It remained at 21% when Bulgaria and Romania joined the EU.

4 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:283:0033:0040:EN:PDF
Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal energy market.

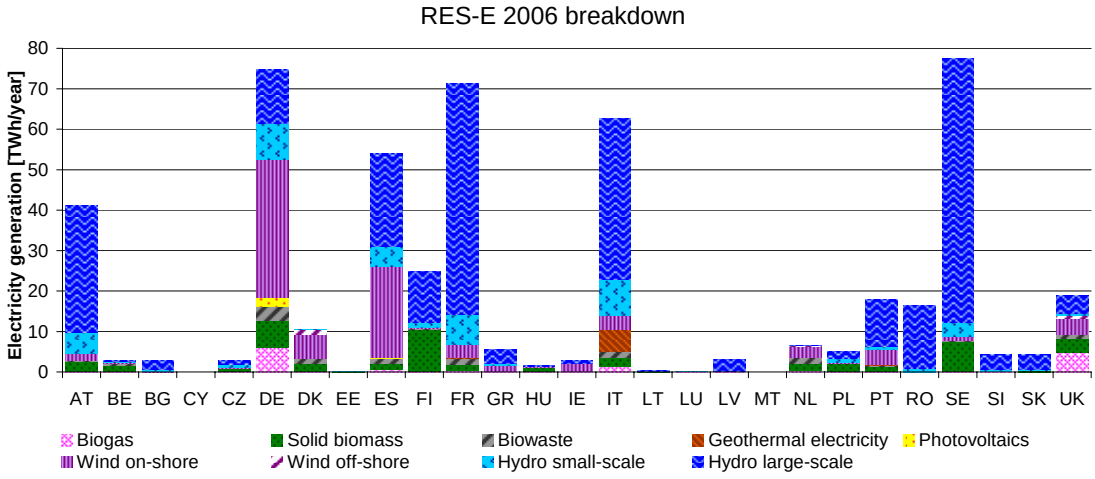
In 1997, when the European Commission initiated discussions on a European renewable energy policy, the share of renewable electricity in what is now the European Union was 12.9%. By 2006, 15.7% of the European Union's final electricity consumption was from renewable energy sources: a 21.7% increase from 1997 levels[5].

Renewable electricity generation in the European Union's 27 Member States in 1997 compared to 2006.



Source: Eurostat data 2006 (with normalised hydro)

Renewable electricity generation in European Union in 2006.



Source: Eurostat/Fraunhofer ISI: Electricity from renewable energy sources 2006 breakdown of normalised renewable electricity in 2006

[5] Source: Eurostat data 2006 (normalised hydro)

2.1 Support Schemes

Member States are required to support electricity from renewable energy sources. Currently, Member States operate 27 different support schemes using various policy tools, including: feed-in tariffs; premium systems; green certificates; tax exemptions; obligations on fuel suppliers; public procurement policy; and research and development. The support schemes differ partly because support has traditionally been linked to other national priorities and also because national electricity markets still have very different characteristics and remain nationally segmented, despite the market opening foreseen by Directive 2003/54/EC[6].

Article 4 of Directive 2001/77/EC required the Commission to present a report in 2005 on the mechanisms for supporting renewable energy. COM (2005)627[7] assessed national support schemes and concluded that rather than immediate harmonisation, a coordinated approach to renewable energy support schemes was more appropriate, based on cooperation between countries and optimisation of support schemes.

On 23 January 2008, the Commission published (SEC (2008)57[8]). This Communication also concluded that although harmonisation of support schemes was a long-term goal it was not appropriate in the short-term. The report noted that by adopting best practices or combining national support schemes Member States could continue to reform, optimise and coordinate their efforts to support renewable electricity.

Long term stability

One element of best practice for national support schemes is to provide stability, such as through the setting of targets or other objectives and the creation of long term support mechanisms. It is not the only critical feature of support schemes, (which also include an adequate level of support and technological differentiation), but if support schemes can be guaranteed for reasonable time periods, they not only produce an income for renewable energy producers, they reassure banks or other financing institutions regarding the risk they face for their loans or investments. If the risk is reduced by a stable and guaranteed minimum income, capital is cheaper. The following table considers Member States' performance on ensuring long term stability in their support scheme.

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6 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:176:0037:0055:EN:PDF
Directive 2003/54/EC of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 96/92/EC

7 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0627:FIN:EN:PDF
Communication from the Commission: the support of energy from renewable sources

8 http://ec.europa.eu/energy/climate_actions/doc/2008_res_working_document_en.pdf
Commission Staff Working Document: the support of electricity from renewable energy sources: accompanying document to COM (2008) 19 proposal for a Directive of the European Parliament and of the Council on the promotion of the use of electricity from renewable energy sources

Table 1: Long term stability of Member States' support schemes.

	Long term stability	
Austria	Feed-in tariffs guaranteed for 10 years with two additional years at a reduced rate.	
Belgium	Minimum prices guaranteed for 10 years (20 years for offshore wind and for photovoltaic power in Flanders).	
Bulgaria	Preferential prices set annually for all renewable electricity plants put into operation before 31 December 2010. (In accordance with Article 3 of the Transitional and Final Provisions Law the Minister for the Economy and Energy is required to develop a market mechanism to promote electrical and thermal energy produced from renewable energy for approval from the Council of Ministers by 31 December 2011).	
Cyprus	A financial mechanism to encourage renewable energy sources is in place until 2010. Revised minimum purchase prices (feed-in) were set at the beginning of 2008. (Cyprus intends to introduce additional programmes for the promotion of renewable energy in the future).	
Czech Republic	Support guaranteed (feed-in tariff) for 15 years from the date a plant became operational (if in existence before 2006) and for new plants there is a decrease in the feed-in tariff of 5% per annum.	
Denmark	Variable bonuses on top of the market price for electricity, guaranteed for 10 years.	
Estonia	12 year mandatory purchase prices (feed-in tariffs).	
Finland	Low interest loans granted for up to 10 years. (New support schemes or the extension of existing ones will be re-considered if current measures fail to promote electricity from renewable energy sources sufficiently).	
France	Obligation to buy electricity from renewable energy sources at a price fixed higher than the market price (feed-in tariff) for 15-20 years.	
Germany	Feed-in tariff guaranteed for 20 years (15 years for large hydro plants and 30 years for small hydro plants).	
Greece	Feed-in tariff guaranteed for 10 years; this can be extended by 10 years following a producer's unilateral declaration to the responsible operator.	
Hungary	Prices (feed-in tariffs) are guaranteed to ensure a return on investment.	
Ireland	Feed-in tariff guaranteed for 15 years but for no longer than 2024.	
Italy	The solar feed-in tariff is guaranteed for 20 years but ceases to exist once 1200 MW have been installed.	
Latvia	Set prices (feed-in) for electricity from renewable energy sources (apart from hydro over 5 MW, geothermal and photovoltaic), guaranteed for 10 years or until target levels for each type renewable energy source are met (target levels are set by the Government annually). Wind over 0.25 MW has to compete via tenders.	
Lithuania	Feed-in tariff until 2020. The National Energy Strategy commits to introducing green certificates or other systems beyond 2020.	
Luxembourg	Feed-in tariff for 15-20 years. However, legal uncertainty about state aid matters (recently resolved) resulted in little new deployment of renewable electricity.	
Malta	Net metering for solar energy systems and one-off grants of 25% for wind and 20% for solar.	
The Netherlands	Fixed prices for 10 years in principle but this time period can be shortened or lengthened depending on the type of renewable energy source. The Minister for Economic Affairs sets the budget for subsidies annually[9].	
Poland	Vendors are obliged to purchase all electricity they are offered at a fixed price set by the Energy Agency on the basis of the average electricity price of the previous year. All electricity from renewable energy sources in Poland is eligible. There is no time limit.	
Portugal	Guaranteed feed-in tariff for 15 years (12 for wind and 25 for hydro) which expires when target levels for renewable electricity are met: 21 GWh for solar and 52 GWh of hydro per annum.	
Romania	Annual obligatory quotas until 2012.	

[9] Although the Netherlands' support scheme does not guarantee long-term investment it should be enough to meet its 2010 target. A more stable, long-term support scheme will be needed to meet the 2020 target.

Slovak Republic	Fixed purchasing prices (feed-in) for 12 years.	
Slovenia	Feed-in tariffs and a bonus price are available for 5 years in full, they then reduce by 5% for a period of 5 years and then by 10% after 10 years.	
Spain	Feed-in tariffs are guaranteed for 15-25 years at a fixed price and continue at a lower fixed rate thereafter. The bonus payment (feed-in premium) is paid for the entire lifetime of the system; however depending on the source of energy and the efficiency of a plant, the first 15 to 25 years of operation are awarded higher payments.	
Sweden	Electricity certificate system until 2030.	
United Kingdom	The level of the Renewables Obligation will increase in annual steps from 7.9% in 2007/08 to 15.4% by 2015. The 2015 level will remain until 2027.	

Source: Member States' 2007 Reports

Key	
	Stable support scheme
	Some aspects of the support scheme weaken the stability of the scheme
	Considerable uncertainty undermines the stability of the scheme.

Although the majority of Member States have long-term targets and guaranteed support schemes in place, several countries need to do more to ensure that they are providing the best environment to facilitate the levels of renewable energy deployment needed. For instance, Bulgaria and Cyprus only have guaranteed support schemes in place until 2010 and Romania's support is only guaranteed until 2012. As all Member States have ambitious 2020 renewable energy targets it would be prudent to ensure continuity of well designed support schemes with a view to reducing investor risk and the cost of capital (while maintaining compatibility with the State aid rules).

(Further details on Member States' support schemes are provided in Annex A).

2.2 Administrative barriers and grid access

Directive 2001/77/EC requires that electricity from renewable energy sources has guaranteed access to the grid and requires Member States to set rules for sharing and bearing the cost of various grid investments necessary to integrate it. Member States are also permitted to give priority access to networks.

COM(2006)848[10] noted that grid connections and extensions needed to be simplified and stated that the Commission would "*continue to co-operate closely with grid authorities, European electricity regulators and the renewables industry to enable a better integration of renewable energy sources into the power grid, with particular attention paid to the special requirements related to much larger deployment of off-shore wind energy, notably as regards cross-border grid connections;*"

SEC(2008)57[11] noted that despite the requirements of Directive 2001/77/EC, project developers still faced different grid-related barriers, which were mainly related to insufficient grid capacity, non-transparent procedures for grid connection, high connection costs and long lead times to obtain authorisation for grid connection. The Communication noted that high priority should be given to removing administrative barriers and improving grid connection for renewable energy producers.

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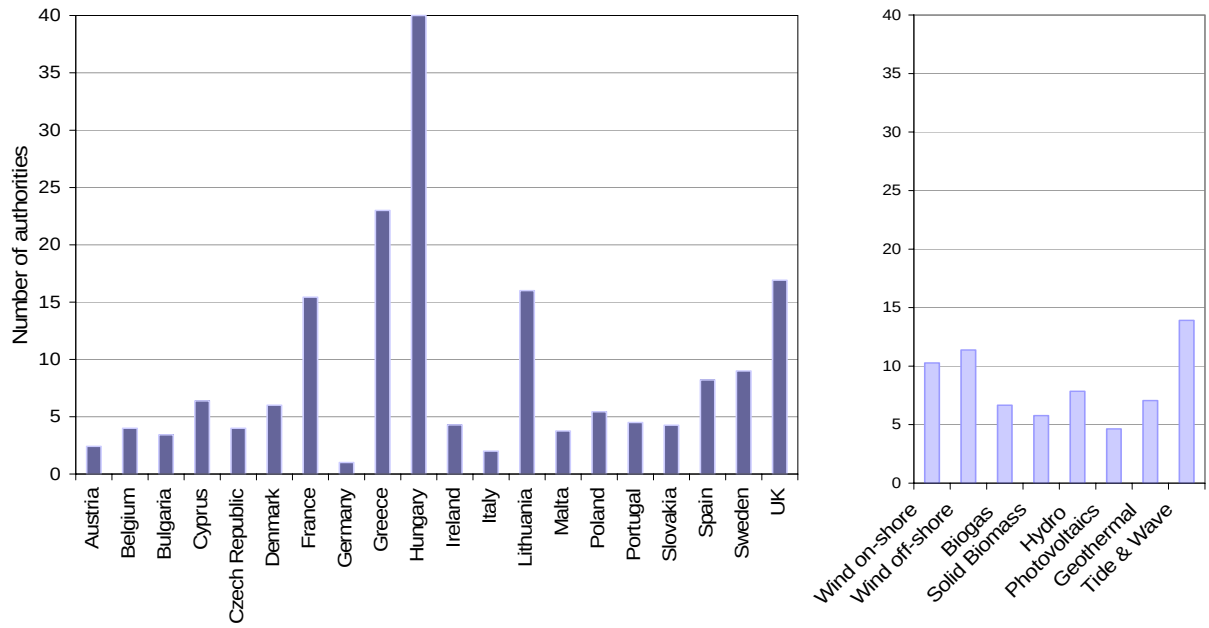
10 http://eur-lex.europa.eu/LexUriServ/site/en/com/2006/com2006_0848en01.pdf
Communication from the Commission to the Council and the European Parliament: renewable energy roadmap: renewable energies in the 21st century: building a more sustainable future.

11 http://ec.europa.eu/energy/climate_actions/doc/2008_res_working_document_en.pdf
Commission Staff Working Document: the support of electricity from renewable energy sources. Accompanying document to the proposal for a Directive to the European Parliament and to the Council on the promotion of the use of electricity from renewable energy sources (COM (2008) 19)

Commission analysis has also been undertaken to examine some of the administrative procedures that are considered to be potential barriers to the development of renewable electricity. An examination of the permit regimes for building renewable electricity plants highlighted a wide variety of practices across Member States. On average, over nine different authorities needed to be contacted. This amount varied according to the Member State, the technology in question and sometimes the size of the installation.

Average number of authorities involved in the building permission procedure

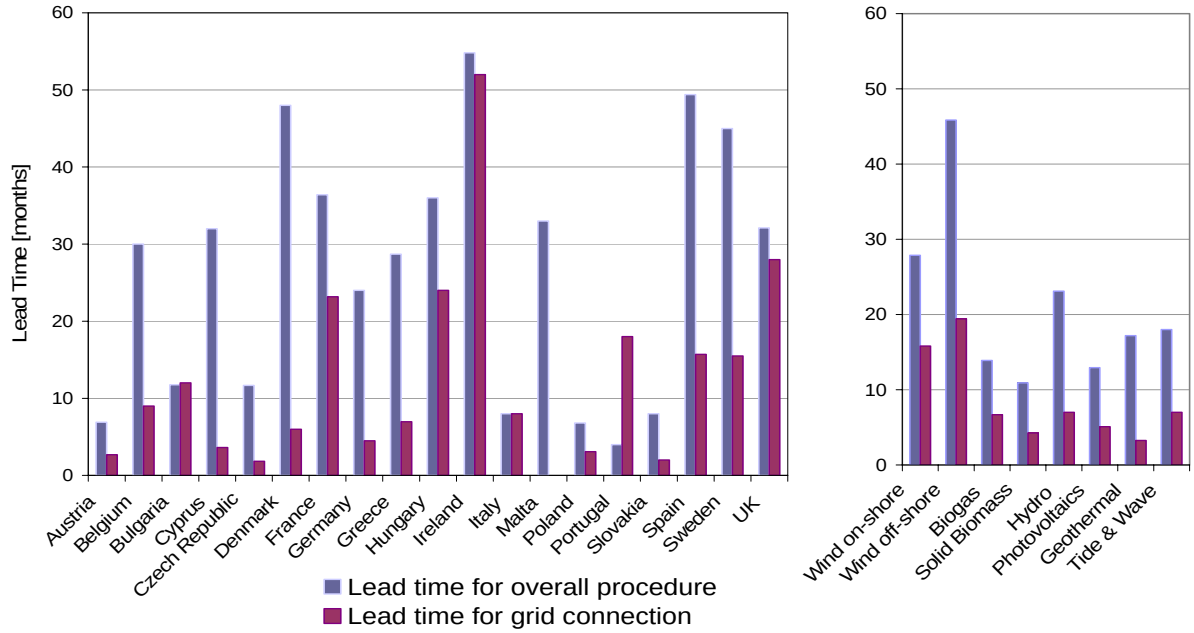


Source: "Promotion and growth of renewable energy sources and systems" Final Report, Ecofys et al. p67

There have been some reforms to the authorisation process in recent years. For example, the UK revised its legislation on planning permission for projects of national interest[12] and the Greek government has begun to streamline environmental permission procedures by setting up two central bodies to coordinate procedures and has limited the time authorities have to grant or deny permits to 6 months. National practices differ, and whilst most informed, potential renewable electricity producers believe that the procedures for licensing are clear; a common complaint is the lack of time limits for responses. This problem appears to have been exacerbated by the introduction of tiers of regional government working in conjunction with support schemes or authorising bodies at a national level. Examining the duration of permit planning also reveals differences according to Member States and technologies:

[12] Planning Act 2008: http://www.opsi.gov.uk/acts/acts2008/pdf/ukpga_20080029_en.pdf

Average lead time for overall authorisation procedure and grid connection

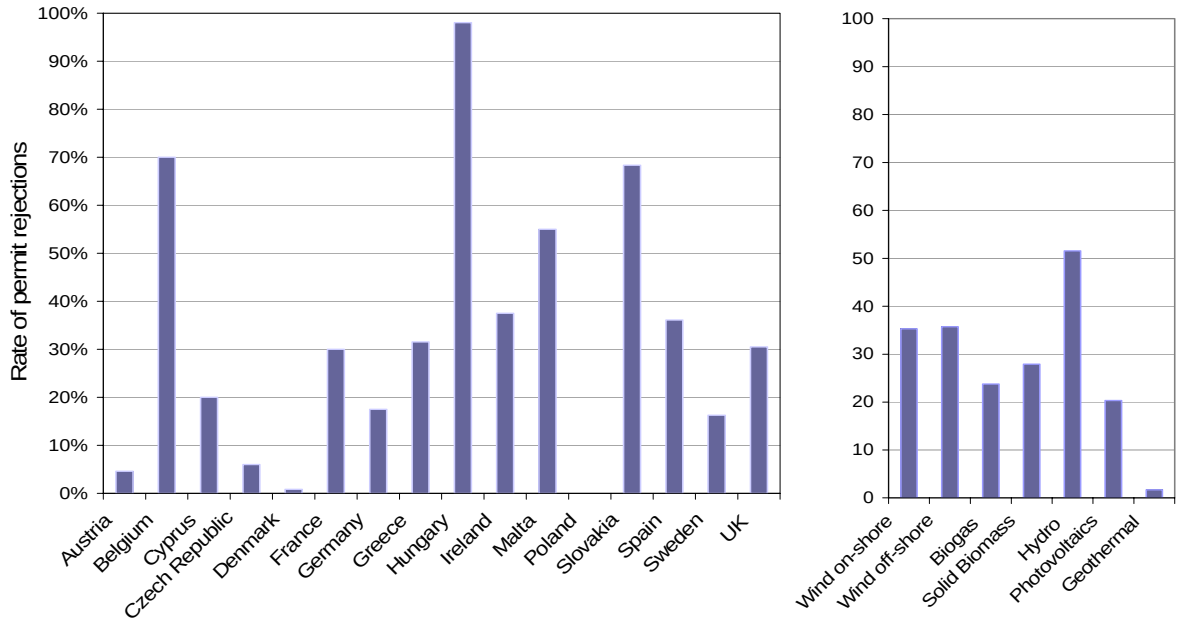


Source: "Promotion and growth of renewable energy sources and systems" Final Report, Ecofys et al. p72

In general, average lead times for grid connection were very high representing a significant bottleneck. Exceptionally high authorisation procedure lead times were reported for offshore wind developments.

The uncertainty of the procedure and the time it takes to complete the process compound the uncertainty of the overall acceptance or rejection of an application. On this point to there is wide variation across Member States but less variation according to technology:

The average rate of permit rejections.



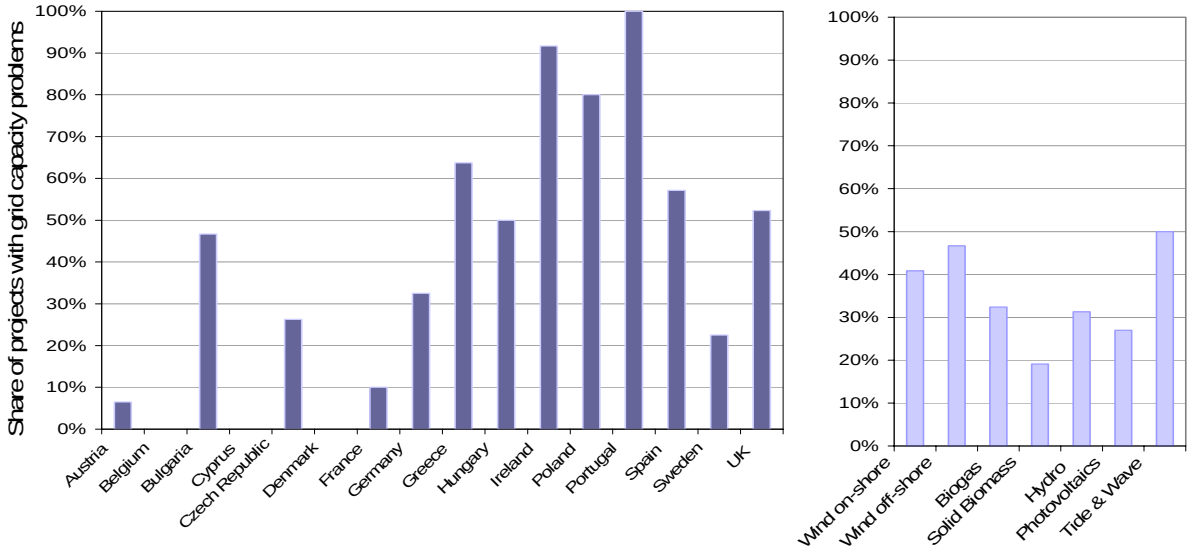
Source: "Promotion and growth of renewable energy sources and systems" Final Report, Ecofys et al. p74

The average rate of permit rejection is 30% but in some cases (reflecting ad hoc moratoriums on certain technologies in certain regions or countries) the rate is much higher. In many cases,

a lack of grid capacity represents a crucial factor for rejection. This and other reasons (such as an excess of applications) suggest that better structured administrative procedures, further administrative resources and coordination with grid planning is necessary. For instance, in countries with a high rate of successful planning appeals, an increase in resources for initial applications could speed up the treatment of applications, increase the rate of initial approvals and reduce the administrative costs associated with appeals.

Analysis of the planning process reveals that problems relating to grid connection and capacity are a major obstacle which is more often generated by limits on administrative and other resources than technological constraints.

Perceptions of insufficient grid capacity.



Source: "Promotion and growth of renewable energy sources and systems" Final Report, Ecofys et al. p76

One important element for ensuring that there is sufficient grid capacity is grid expansion financing. One crucial problem is a lack of clarity regarding cost breakdowns and in some Member States there appears to be no transparency. Also in some Member States grid connection and expansion costs and the charging regimes of some transmission system operators and distribution system operators still favour incumbent producers and discriminate against new often decentralised smaller renewable electricity producers. This hampers job creation and growth at local and regional level.

2.3 Guarantees of Origin

Article 5 of Directive 2001/77/EC requires that Member States outline the measures taken to ensure the reliability of the system they have in place to guarantee the origin of electricity. Most Member States have reported that they have legislated to create at least the framework for the system of guarantees of origin. That said, the actual use made of the guarantees of origin differs widely across Member States. In some instances they are used in conjunction with green certificate/obligations support schemes. In most cases they are used by electricity suppliers to show their consumers that they have purchased "green electricity". The implementation of the system of guarantees of origin was partly meant to help Member States and electricity suppliers fulfil their obligations to prove the nature of the energy mix they provide to consumers under Directive 2003/54/EC[13]. Member States are required to ensure

[13] concerning common rules for the internal market for electricity

that the reporting of energy mix by suppliers is reliable. However, a forthcoming study undertaken for the Commission raises concerns that whilst legislation might be in place, current differences in national schemes and a lack of standardisation, mutual recognition and verification mean that the use of guarantees of origin is not always reliable, and their role as a standard proof of renewable electricity is at times constrained or unrecognised. (See E-TRACK II, final report due March 2009 http://www.e-track-project.org/). This is another matter which is being addressed in the new Directive on renewable energy and will be followed closely by the Commission.

2.4 Member State progress towards the 2010 targets

Each Member State has a target for the amount of electricity they should produce from renewable energy sources by 2010. The table below show the effort made so far by each Member State.

Table 2: Electricity from renewable energy sources: progress towards the 2010 target

Member State	Share the reference year[14]	Share in 2004 (%)	Share in 2006 (%)	Change in percentage points in shares 2004-2006	Progress made towards target from reference year in 2006 (%)	2010 target (%)
Austria	69.00	60.94	61.62	0.7	0	78.1
Belgium	1.06	2.15	3.89	1.7	57.29	6
Bulgaria	6.37	6.43	6.82	0.4	9.72	11
Cyprus	0.00	0.00	0.00	0.0	0	6
Czech Rep	3.47	3.68	4.11	0.4	14.13	8
Denmark	8.87	27.08	25.93	-1.2	84.75	29
Estonia	0.26	0.59	1.45	0.9	24.59	5.1
Finland	26.29	26.79	26.47	-0.3	3.45	31.5
France	15.62	14.01	14.29	0.3	0	21
Germany	6.33	10.58	12.59	2.0	+100	12.5
Greece	7.70	7.59	8.79	1.2	8.79	20.1
Hungary	0.48	2.28	3.68	1.4	+100	3.6
Ireland	4.25	5.65	8.57	2.9	48.27	13.2
Italy	15.52	15.78	18.32	2.5	40.11	22.55
Latvia	47.48	46.01	40.40	-5.6	0	49.3
Lithuania	3.56	3.43	3.87	0.4	9.01	7
Luxembourg	1.21	3.33	3.67	0.3	54.79	5.7
Malta	0.00	0.00	0.00	0.0	0	5
Netherlands	3.51	5.71	7.93	2.2	80.51	9
Poland	1.63	2.19	3.05	0.9	24.19	7.5
Portugal	32.56	28.56	31.16	2.6	0	39
Romania	30.66	29.15	28.05	-1.1	0	33
Slovak Rep	14.49	13.55	16.00	2.5	9.15	31
Slovenia	29.66	29.37	28.26	-1.1	0	33.6
Spain	16.45	18.58	19.11	0.5	20.54	29.4
Sweden	47.99	51.52	52.28	0.8	35.72	60.0
UK	2.12	3.64	4.63	1.0	31.85	10
EU27	**12.85**	**14.35**	**15.72**	**1.4**	**35.21**	**21**

Source: Eurostat (with normalised hydro)

To reach the 2010 target the EU had to increase the share of electricity from renewable energy sources from 13% to 21%. In 2006 it stands at 15.7%, which equates to 35.2% (2.87/8.15) of progress needed to reach the 2010 target.

[14] Reference year for EU-15 is 1997. Reference year for EU-12, BG and RO is 2000.

In 2006, Belgium, Denmark Ireland, Luxembourg, The Netherlands, Sweden had made more progress towards their 2010 target than the European average, and Hungary and Germany and Hungary had reached their target (or in fact, exceeded it).

It should be noted that the share of electricity from renewable energy sources in Austria, France, Latvia, Portugal, Romania and Slovenia was lower in 2006 than in the reference year. Therefore, these Member States need to do more to reverse their downward trends. This is particularly true for France which had an annual decrease from 1997-2005.

In 2006, *twenty one* Member States were less than half way towards meeting their 2010 target for electricity from renewable energy sources. Several Member States are unlikely to meet their 2010 targets.

Table 3: The likelihood of Member States meeting their 2010 electricity from renewable energy sources targets.

	Expect to meet the target?
Austria ☹	Between 2004 and 2006 electricity consumption increased by 4.7% and electricity from renewable energy sources increased by 5.9%. However Austria still has a lower share in 2006 than it did in 1997.
Belgium 😐	Between 2004-2006 electricity from renewable energy sources increased by over one and a half percentage points, and it is over half way towards its target. Belgium expects to have 6900 GWh of electricity from renewable energy sources in 2010 and 95,670 GWh electricity consumption. This would equate to 7.2% electricity from renewable energy sources, exceeding the 6% target.
Bulgaria ☹	Between 2004 and 2006 electricity from renewable energy sources increased by 13% whilst total electricity consumption increased by 6.6%. However, the share of electricity from renewable energy sources has risen by less than half a percentage point and Bulgaria is still some way off from its target.
Cyprus ☹	Cyprus aims to have 6% electricity from renewable energy sources by 2010 (4.5% from biomass and 1.5% from photovoltaics and some wind power). However in 2006, 0% electricity came from renewable energy sources and between 2004 and 2006 Cyprus' final electricity consumption increased by 10.7%. Adequate support scheme should be implemented urgently together with eliminating administrative barriers to RES-E deployment.
Czech Republic ☹	Transposition of Directive 2001/77/EC has been slow and short-term, support schemes have not provided a stable environment for investment and there are administrative barriers to further deployment. Between 2004 and 2006 electricity from renewable energy sources increased by 17%, whilst final electricity consumption increased by 4.5%, however progress towards the target is only 14%.
Denmark ☺	Denmark expects to have 33% electricity from renewable energy sources by 2010 (target 29%). Between 2004-2006 Denmark's electricity from renewable energy sources decreased by 1.1% whilst electricity consumption increased by 3.3%.
Estonia ☹	Despite significant increases in the absolute quantity of electricity generated from renewable energy sources, growth as a share of total electricity consumption is slow and progress towards the target limited.
Finland ☹	From 1997 to 2006 electricity from renewable energy sources fluctuated between 25 and 27.1% (target 31.5%). Finland's electricity from renewable energy sources grew by 2.1% between 2004 and 2006 whilst its electricity consumption grew by 3.3%. Finland will need to diversify its renewable energy sources in order to meet its 2010 target.
France ☹	Between 2004 and 2006 electricity from renewable energy sources increased by 1.8% whilst electricity consumption decreased by 0.24%. However, with a 2006 share still below that of 1997, France is a long way from achieving its target.
Germany ☺	Germany has passed its 12.5% target. Germany is strongly committed to developing electricity from renewable energy sources which increased by 20.1% between 2004 and 2006 whilst electricity consumption grew by 0.89%.

Greece ☹	Between 2004 and 2006 electricity from renewable energy sources increased by 21.1% whilst electricity consumption grew by 4.5%. In line with earlier estimates, Greece predicts that electricity from renewable energy sources will grow, but with less than 10% of the effort made towards the target, it seems unlikely that the target will be reached.
Hungary ☺	Hungary has already exceeded its 3.6% electricity from renewable energy sources target (the lowest in the EU). Between 2004 and 2006 electricity from renewable energy sources increased by 68.6% whilst final electricity consumption increased by 4.6%. However, it should be noted that the share decreased between 2005 and 2006 by 17.1%. More long term policies are needed to maintain the 2010 target achievement and to ensure favourable conditions for the post 2010 period.
Ireland 😐	Between 2004 and 2006 Ireland's electricity from renewable energy sources increased by 63.5% whilst electricity consumption increased by 7.8%. Ireland expects to meet its 13.2% target but must make significant efforts to complete the remaining 53% of progress towards the target.
Italy 😐	Between 2004 and 2006 electricity from renewable energy sources increased by 2.5 percentage points, however it still has to make 60% of the effort needed to reach its target.
Latvia ☹	The proportion of electricity from renewable energy sources in Latvia is decreasing. Latvia will need to do substantially more if it is to meet its electricity from renewable energy sources target.
Lithuania ☹	Lithuania expects to reach its target, but progress to 2006 has been slow. The share of electricity from renewabl energy sources grew by 0.4 percentage points between 2004 and 2006, and over 90% of the effort to reach the target remains to be made.
Luxembourg 😐	Uncertainty regarding the feed-in tariff regime and State Aid rules which have only recently been resolved, has slowed developments since 2005. Between 2004 and 2006 electricity from renewable energy sources increased by 15.8% and electricity consumption increased by 4.9%.
Malta ☹	Malta is very unlikely to meet the 2010 target as little attention has been given to electricity from renewable energy sources. Between 2004 and 2006 electricity consumption increased by 3.6%. In 2006 the share of electricity from renewable energy sources was still 0%. Malta has committed to reviewing and increasing support mechanisms.
The Netherlands ☺	Between 2004 and 2006 electricity from renewable energy sources increased by 42.4% whilst electricity consumption grew by 2.5%. Support was frozen in August 2006 creating uncertainty for investors; however the reintroduction of support in 2008 should ensure that the Netherlands meets its target.
Poland ☹	Due to increased quota obligations and higher certificate prices, faster growth is expected from 2007. However, in 2006 Poland only had 3.1% electricity from renewable energy (24% of the effort needed to reach its 2010 target), with less than once percentage points growth between 2004 and 2006.
Portugal ☹	In 2007 Portugal set a national target of 45% electricity from renewable energy sources by 2010 (their indicative target is 39%). However the current % is still below the reference year.
Romania ☹	Between 2004 and 2006, electricity from renewable energy sources increased by 1.7% whilst electricity consumption increased by 5.7%. More effort is needed in order to meet the 2010 target as Romania's share of electricity from renewable energy sources has *decreased* since 2000.
Slovakia ☹	Between 2004 and 2006 electricity from renewable energy sources increased by 19.5% and electricity consumption increased by 1.2% but Slovakia is still some way off the target. New tariffs were set in 2008 so progress in 2008 should give better future growth.
Slovenia ☹	Slovenia will find it difficult to meet the 2010 target without major changes in investment and new production capacity in renewable energy sources. Between 2004 and 2006 electricity from renewable energy sources increased by 0.4% whilst electricity consumption increased by 4.7%; the share of electricity from renewable energy sources decreased.

Spain ☹	Spain expects to exceed its 29% target by 2010.This is based on estimates of 100 TWh of electricity from renewable energy sources from a total 337.4 TWh electricity consumption. However between 2004 and 2006, electricity from renewable energy sources increased by 11.3% and electricity consumption increased by 8.2% - an increase in share of 0.5 percentage points, and Spain still needs to make 80% of the efforts to reach the target. That said, Spain increased its support for electricity from renewable energy sources in May 2007 therefore 2008 data should give stronger future growth and improve the chances of Spain meeting its 2010 target.
Sweden 😐	. Between 2004 and 2006 electricity from renewable energy sources increased by 1.3% and electricity consumption decreased by 0.19%. Sweden is on tract to meet its target, but still needs to make 65% of the effort.
United Kingdom ☹	Between 2004 and 2006, electricity from renewable energy sources increased by 28.6% and electricity consumption increased by 1.1%. However the UK still has to make 68% of the efforts needed to reach its target. There are significant delays in connecting electricity from renewable energy sources to the transmission and distribution network and the UK needs to increase the speed of deployment substantially in order to meet the 2010 target. In February 2008 there were 11GW of capacity in the planning system waiting for consent.

Source: information from Member States' reports and growth rates based on Eurostat 2006 data (with normalised hydro generation).

Key to "smiley" grades: % of progress from reference year (1997/2000) to 2010 target

0-33%	*34-66%*	*67-100+*
☹	😐	☺

In 2006, the Commission noted that the EU was not on track to meet its 21% electricity from renewable energy sources target, predicting that an 18-19% share of electricity from renewables sources would be achieved by 2010. This prediction was based on Member States' progress against their national indicative targets up to 2005.

The Commission still expects all Member States to bring forward policies in order to meet their national indicative target. Indeed, given the new targets established for 2020, the 2010 targets act as a necessary minimum interim sectoral target. Improvements to national support schemes and the ongoing integration of the internal market should facilitate growth of renewable electricity but most Member States still need better, active policies to ensure growth occurs.

3. THE TRANSPORT SECTOR

Article 4.2 of the Biofuels Directive states:

"*By 31 December 2006 at the latest and every two years thereafter the Commission shall draw up an evaluation report for the European Parliament and for the Council on the progress made in the use of biofuels and other renewable fuels in the Member States.*

This report shall cover at least the following:

(a) the cost-effectiveness of the measures taken by Member States in order to promote the use of biofuels and other renewable fuels;

(b) the economic aspects and the environmental impact of further increasing the share of biofuels and other renewable fuels;

(c) the life-cycle perspective of biofuels and other renewable fuels, with a view to indicating possible measures for the future promotion of those fuels that are climate and environmentally friendly and that have potential of becoming competitive and cost-efficient;

(d) the sustainability of crops used for the production of biofuels, particularly land use, degree of intensity of cultivation, crop rotation and use of pesticides;

(e) the assessment of the use of biofuels and other renewable fuels with respect to their differentiating effects on climate change and their impact on CO2 emissions reduction;

(f) a review of further more long term options concerning energy efficiency measures in transport."

It follows that the current reporting exercise needs to have two parts: progress in the use of biofuels and other renewable fuels and environmental and economic impacts (points (a) to (f)).

For the first part, the Commission commissioned PricewaterhouseCoopers to conduct a review of Member States' data. Member States' progress reports under the Directive were analysed and a questionnaire was sent to Member States and stakeholders to collect additional data. Based on this work, this working document includes new analysis of Member States' support schemes for biofuels.

In preparing the second part, the Commission took account of the fact that the previous (2007) progress report focussed particularly on economic and environmental impacts. These impacts have, in addition, been the subject of extensive discussion as part of the examination of the proposed Renewable Energy Directive. The agreed text of that Directive includes extensive monitoring and reporting requirements on these topics which will certainly lead to a substantial increase in knowledge and understanding, as well as sustainability requirements which will alter the impacts of the biofuels consumed. For that reason, while this report updates the economic and environmental analysis made in the last progress report, it does not undertake extensive new assessments.

For all of this discussion it should be noted that "biofuels" is a subset of biomass, referring to liquid or gaseous fuel for transport produced from biomass.

3.1 Progress in the use of biofuels and other renewable fuels

According to Member States' reports, in 2007 8.1 Mtoe (2.6%) of the total fuel consumed in transport in the EU was from biofuels. In 2007 biodiesel accounted for 6.1 Mtoe or 75% of renewable fuels in transport, of which 26% was imported. Bioethanol constituted 1.24 Mtoe or 15% of renewable fuels in transport of which 31% was imported, the remaining 10% being made up from pure vegetable oil consumed in Germany, Ireland and the Netherlands and biogas in Sweden.

As in the previous period, there was no reported consumption of other types of renewable energy in transport. (The use of hydrogen from any source remains insignificant. A little electricity is used in road transport, a part of which could legitimately be attributed to renewable energy, but Member States preferred to classify this as electricity from renewable energy rather than as transport from renewable energy.)

Germany, France, Austria, Sweden and UK remained the 5 largest biofuel consumers in 2006 and 2007, consuming 87% and 81% of the total EU biofuels respectively.

Table 4: Biofuel consumption and energy share for the EU 27 in 2005 – 2007.

	Fossil fuel (Ktoe) (c)	Biodiesel (Ktoe)	Vegetable oil (Ktoe)	Bio-ethanol (Ktoe)	Biofuel (Ktoe)	Share (%)	Total fuel (Ktoe)
2005(a)	292876	2277	182.4	552	3011	1.02	295901
2006	303125	4082	648	881	5611	1.82	308751
2007(b)	306295	6091	768	1246	8105	2.58	314400

(a) EU 25

(b) Cyprus and Finland's biofuel data is missing. Biofuel data for Belgium, Bulgaria, Czech Republic, Denmark, Germany, Greece, Hungary, Luxembourg, Poland, Portugal, Slovakia and Spain are taken from EurObserver's Biofuel Barometer[15].

(c) Fossil fuel data corrected with the last 6 year trend from Eurostat data on fossil fuel consumption in the transport sector where missing.

(d) Sweden consumed 13.7 Ktoe of biogas in 2005, 14.6 Ktoe in 2006 and 24.07 Ktoe in 2007.

The following table shows developments in the share of domestically produced biofuel between 2005 and 2007.

Table 5: Biofuel self-sufficiency in the EU27 (ratio of production to consumption in %).

Biodiesel sufficiency ratio			Bioethanol sufficiency ratio			Biofuel sufficiency ratio		
2005	2006	2007	2005	2006	2007	2005	2006	2007
114	91	74	83	91	70	109	91	73

Note: 100% implies full self sufficiency; a higher figure implies potential for export of biofuels; and a lower figure means that some or all of biofuel consumption in a given Member State is met by imports.

Source: Source: PwC based on Member States' Reports, EBB and EBio (producer data) and EurObserver's Biofuel Barometer

It can be seen that the share of domestic biodiesel production, in particular, has been falling (and it can be expected that this trend continued in 2008). The overall balance for biodiesel changed from positive in 2005 with 14% (355 Ktoe) exported to negative in 2007 with 25.8% (1.8 Mtoe) imported. During the same period, the bioethanol deficit increased from 17% (171 Ktoe) in 2005 to 31% (397 Ktoe) in 2007.

The main reason for the change was the increasing market share of competitively priced biofuel for import, mainly soy oil methyl ester (SME B-99.9) from the United States and

[15] Biofuels Barometer, EurObserv'ER 49, June 2008

Argentina. The EU's estimated import of SME B-99.9 in 2007 was 1 million tonnes, up from 90,000 in 2005. In both the US and Argentina, industry mainly serves the export market. The European Commission started a formal anti-dumping investigation in June 2008, which could lead to the imposition of punitive tariffs on SME B-99.9 imports from the United States. Initial findings are expected in mid-March 2009.

To meet the national targets that Member States have set themselves under the Directive, the consumption of biofuel and other renewable fuels would need to more than double over the next two years. Assuming that in 2010 the increase in fuel for transportation was the same as in 2000-2006 for each Member State and the ratio between bioethanol and biodiesel remained the same as the average observed in 2005-2007, the additional biofuel consumption would be approximately 10 Mtoe (7.8 Mtoe biodiesel and 2.8 Mtoe bioethanol). The additional estimated biofuel required in each Member State is indicated in the Table 6.

Table 6: Estimation of the additional biofuel needed to reach national targets in 2010 (Ktoe).

	Annual rate of variation of the fuel consumption in the transport sector	Estimated need of Fuel for the road transport sector in 2010 (KToe)	2010 target share (national target as notified to Commission)	Estimation Additional biofuel needed in 2010 in KToe	Estimation Additional biodiesel needed in 2010 in KToe	Estimation Additional bioethanol needed in 2010 in KToe
Austria	3.65	9335	5.75	176	171	4
Belgium (E)	-0.14	8414	5.75	393	393	0
Bulgaria (E)	7.02	2725	5.75	44	20	24
Cyprus	1.37	1080	2.50	27	23	4
Czech Rep. (E)	6.03	7787	5.75	415	414	1
Denmark (E)	2.03	4555	5.75	256	0	256
Estonia	5.26	1050	5.75	60	50	10
Finland	1.77	4328	5.75			
France	-0.24	41571	7.00	1486	1192	294
Germany	-0.75	50006	6.25	-868	-799	-69
Greece (E)	2.76	7114	5.75	329	329	0
Hungary (E)	6.17	5430	5.75	303	4	299
Ireland	4.92	5303	5.75	284	263	21
Italy	1.09	40827	5.75	2171	2171	0
Latvia	7.45	1360	5.75	76	60	17
Lithuania	5.98	1420	5.75	14	9	5
Luxembourg (E)	5.35	2757	5.75	124	121	3
Malta	3.49	166	5.75	8	8	0
Poland	1.99	11153	5.75	563	231	332
Portugal	6.61	8900	5.75	345	345	0
Romania	1.43	5868	5.75	293	293	0
Slovakia	3.75	2208	5.75	74	62	12
Slovenia	3.76	1792	5.00	76	73	3
Spain (E)	2.90	36284	5.75	1713	854	859
Sweden	3.55	8259	5.75	108	33	75
The Netherlands	0.84	10972	5.75	386	230	156
UK	1.17	41596	5.00	1731	1246	484
EU 27		322259		10585	7794	2791

Source: Member States' reports on biofuel and from EUROSTAT data on fuel consumption from road transport

3.2. Support schemes

This section analyses the different measures taken by Member States to promote the use of renewable fuels in transport. Across the EU there are both general support measures and specific support measures which apply to certain producers or users.

General support measures

Tax relief and obligations to blend are the two most common instruments[16] used by Member States to promote biofuels, with important developments having taken place over the last two years. In 2005-2006 all Member States, except Finland, used tax exemptions as the main support measure, while obligations to blend were only used by 3 countries (Austria, France and Slovakia). Since 2007, more than half of Member States (Austria, Cyprus, Czech Republic, France, Germany, Italy, Lithuania, Luxembourg, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, The Netherlands and United Kingdom) have adopted obligations to blend. In most cases, an obligation to blend was combined with partial but increasing levels of taxation (i.e. Austria and Greece for ethanol and Luxembourg and Portugal for biodiesel) or unchanged levels of taxation[17] (i.e. The Netherlands).

Some countries utilise a quota mechanism (Belgium, France, Italy, Ireland and Portugal) where the amount of biofuel benefiting from support is shared amongst different suppliers through calls for tender. This mechanism allows Governments to decide the amount of biofuels that has to be supplied each year, thus creating some regulation of the market.

Introducing obligations to blend in addition to existing tax relief has boosted biofuel growth in many Member States, leading to considerable progress towards 5.75% target. For example, the introduction of compulsory blending in 2007 led to a rapidly increasing share of biofuels in the Netherlands from 0.3% in 2006 to 2% in 2007. Some Member States claim that their obligations are not yet legally enforceable and therefore have not yet a strong influence on the market. They therefore maintain other support mechanism in parallel to the obligations.

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16 Surveys of policies aiming at developing biofuel industry and consumption are common. The most comprehensive are the reports by PREMIA, ECN, Kutas-Lindberg-Steenblik (KLS, by IISD of Geneve), OECD and two of Intelligent Energy Europe, i.e. Refuel and Biodiesel Chains (BC), plus notifications of State Aid to the Commission. KLS and BC (albeit only referring to biodiesel) reports are very detailed. These sources, containing useful information about policies and instruments sometimes not available in the Member States' Reports, have been tapped on to integrate the information of the Member States' reports, which remain the most important source of information. [Please give complete references for all sources]

17 In United Kingdom the level of rebate is fixed up to 2010 (20 pence/litre).

The following table summarises different biofuel support measures used by Member States.

Table 8: General support measures: tax relief and obligations to blend.

MS reports	Country	Period	Tax relieves	Timing reference	Obligation to mixture		National percentage share on the total EU 27 conventional fuels 2007	National percentage share on the total EU 27 all biofuels 2007
2008	**Austria**	2005-2006	x	jan05-june07	x	oct05-oct08	2.7	4.5
		2007-2008	x ↑	from july07(BD)-oct07(BE)	x	(yearly increasing obligations, up to 5,75%, already reached)		
2007	**Belgium**	2005-2006	x	from nov06			2.8	1.1
		2007-2008	x					
2007	**Bulgaria**	2005-2006					0.7	1.4
		2007-2008	x	from jun07				
2007	**Cyprus**	2005-2006					0.3	n.a
		2007-2008	x	from 2007 to 2010	x	from 2007 to 2010 (increase up to 2008, after the same at 2%)		
2007	**Czech Republic**	2005-2006	x	dec05-dec06			2.1	0.4
		2007-2008	only pure↓	from Jan 2007	x	2007 to jan 2009 (yearly incr.obligations, up to 4 %)		
2007	**Denmark**	2005-2006	x	from Jan 2005			1.4	0.1
		2007-2008	x					
2008	**Estonia**	2005-2006	x	2005-2011			0.3	0.0
		2007-2008	x					
2007	**Finland**	2005-2006					1.3	0.0
		2007-2008			x trading	from jan 2008 (yearly incr.obligations, up to 5,75 % in 2010)		
2008	**France**	2005-2006	x	By yearly Finance Laws	TGAP	x	13.3	17.6
		2007-2008	x ↓		TGAP	yearly increasing obligations, up to 7 % in 2010		
2007	**Germany**	2005-2006	x	From 2004 to nov 05			16.7	49.5
		2007-2008			x trading	yearly increasing obligations: 6,75 % in 2010, 8% in 2015		
2008	**Greece**	2005-2006	x				2.1	1.0
		2007-2008	x	from 1jan08 no exemption				
2007	**Hungary**	2005-2006	x				1.5	0.1
		2007-2008	x					
2008	**Ireland**	2005-2006	x	from 2006 to 2010			1.2	0.3
		2007-2008	x			It is proposed to introduce obligation in 2010		
2008	**Italy**	2005-2006	x	from April 2006			12.5	2.2
		2007-2008	x	from 2007 to 2010	x trading	yearly increasing obligations (1% in 07, 2% in 08, up to 5,75 % in 2010)		
2008	**Latvia**	2005-2006	x				0.4	0.0
		2007-2008	x	from jan 2007				
2008	**Lithuania**	2005-2006	x	from 2001	x		0.5	0.8
		2007-2008	x		x			
2007	**Luxembourg**	2005-2006	x	in 2006			0.8	0.4
		2007-2008			x	budget Law for 2007		
2008	**Malta**	2005-2006	x	from 2004			0.0	0.0
		2007-2008	x					
2007	**Poland**	2005-2006	x	Apr 2004 - dec 06			3.4	1.2
		2007-2008	x↑	from May 2007				
2007	**Portugal**	2005-2006	x	From March 2006			2.4	2.0
		2007-2008	x		x	not quantified		
2008	**Romania**	2005-2006					1.8	0.5
		2007-2008	x	From May 2007	x	(indicative ?)		
2007	**Slovakia**	2005-2006	x	From May 2006	x	From May 2006	0.6	0.2
		2007-2008	x		x			
2008	**Slovenia**	2005-2006	x	from 1998	x	starting from 2006	0.5	0.2
		2007-2008	x		x	Yearly increasing obligations (up to at least 5 % in 2010) till 2015		
2007	**Spain**	2005-2006	x	From 2003 to 2012			10.9	4.6
		2007-2008	x			from 2009, yearly increasing obligations (up to 5,83 % in 2010)		
2008	**Sweden**	2005-2006	x	Exemption from CO2 tax	x	From April 2006 obligation for larger filling stations	2.5	4.5
		2007-2008	x		x			
2008	**The Netherlands**	2005-2006	x	Detaxation in 2006			4.0	3.0
		2007-2008	x		x	Yearly increasing obligations (up to 5,75 % in 2010)		
2008	**United Kingdom**	2005-2006	x	From jan 2002 to dec 2012			13.1	4.3
		2007-2008	x		x trading	From Apr 2008 (yearly increasing up to 5 % in 2010/11)		
	EU - 27						100.0	100.0

Source: MSs Reports; EBB, Biodiesel Chains (IEE); web news

It is hard to assess which general instrument is more successful in increasing demand for biofuels as many factors other that policy measures influence the dynamics of consumption. The next table attempts to provide some analysis by putting together the data on support measures and overall consumption trends. Due to lack of data, only an analysis of biodiesel could be provided.

Table 9: Evolution of the biodiesel consumption in presence of different measures.

	2006 vs 2005	Growth rate 2006-2005/ 2005 %	2007 vs 2006	Growth rate 2007-2006/ 2006 %
Austria	From tax relieves in 2005 to both measures (+ 8,8) in 2006	72.2	Always both: tax relieves and obligations to blend (+ 2,1)	**14.7**
Belgium	**no consumption in 2005 and 2006**		Always tax relieves (+ 3,8)	
Bulgaria				
Cyprus	**no consumption**		**no consumption**	
Czech Rep.	Always tax relieves (+ 1)	89.3	From tax relieves in 2006 to obligations to blend (+ 0,3) in 2007	**19.9**
Denmark	**no consumption**		**no consumption**	
Estonia	**no consumption**		**no consumption**	
Finland	**no consumption**		**no consumption**	
France	Always both: tax relieves and obligations to blend (+ 9,7)	41.6	Always both: tax relieves and obligations to blend (+ 24,8)	**51.5**
Germany	Always tax relieves (+ 58,2)	43.8	From tax relieves in 2006 to obligations to blend (+ 22,6) in 2007	**14.6**
Greece	From no measure in 2005 to tax relieves (+ 2) in 2006	100	Always tax relieves (+ 1,4)	**41.1**
Hungary	**no consumption**		**no consumption**	
Ireland	Always tax relieves (0)		Always tax relieves (+ 0,8)	
Italy	From no measure in 2005 to tax relieves (0) in 2006		From tax relieves in 2006 to obligations to blend (0) in 2007	
Latvia	Always tax relieves (0)		Always tax relieves (+ 0,1)	
Lithuania	From tax relieves in 2005 to both measures (+ 0,3) in 2006	50.7	Always both: tax relieves and obligations to blend (+ 1,2)	**67.0**
Luxembourg	**no consumption**		From tax relieves in 2006 to obligations to blend (+ 1,4) in 2007	
Malta	**no consumption**		Always tax relieves (0,1)	
Poland	From no measure in 2005 to tax relieves (+ 1) in 2006	99.8	Always tax relieves (-1)	
Portugal	From no measure in 2005 to tax relieves (+ 3) in 2006		From tax relieves in 2006 to both measures (+ 3,7) in 2007	**55.3**
Romania				
Slovakia	From no measure in 2005 to both measures (+ 0,6) in 2006		Always both: tax relieves and obligations to blend (-0,6)	
Slovenia	From tax relieves in 2005 to both measures (0) in 2007		Always both: tax relieves and obligations to blend (+ 0,4)	
Spain	Always tax relieves (+ 1,3)	57.1	Always tax relieves (10,9)	**78.7**
Sweden	From tax relieves in 2005 to both measures (+ 1,8) in 2006	83.3	Always both: tax relieves and obligations to blend (+ 4,6)	**68.3**
The Netherlands	From no measure in 2005 to tax relieves (+ 0,6) in 2006	85.5	From tax relieves in 2006 to both measures (+ 6,2) in 2007	**88.9**
UK	Always tax relieves (+ 4,5)	80.5	Always tax relieves (+ 11,4)	**51.0**
	Notes: the figure in brackets represents the absolute variation (in PJ)			

Source: PwC based on Member States' Reports and EurObserver's Biofuel Barometer

An assessment of the absolute annual change in the consumption of biodiesel for each Member State[18] (2006 compared to 2005 and 2007 compared 2006) identified two main policy combinations:

(a) Adoption of a simple tax relief having had no support measure in the previous year (only applicable for 2005-2006): this approach was adopted by countries with little practical experience in biofuels (such as Greece, Portugal, Italy); countries with experience of a more directly supported approach through funds (such as Poland); and countries taking a more cautious approach (such as the Netherlands). There was little increase in biofuel consumption due to a decrease in indirect taxes in countries

[18] The assessment excludes non consuming countries (plus Italy, for which there is *inconsistency* among figures).

with either no empirical habit or in countries accustomed to more incisive systems of support.

(b) Adoption of a tax exemption and an obligation to blend having had no support measure in the previous year; or adoption of both measures together, replacing just a tax relief.

Specific support measures

In addition to general support measures, some Member States also provide support for biofuels through specific measures. These policy instruments, including subsidies, often apply to either the production or the consumption phase of biofuels.

The production phase includes measures relating to agriculture such as the production of feed stocks and to industry where necessary operations to achieve the intermediate and finished product are carried out[19]. The consumption phase includes measures relating to distribution of biofuels; the purchase and maintenance of cars and vehicles utilizing biofuels; attempts to increase the demand for biofuels through "green" public procurement; and campaigns to increase public awareness. The following table summarises the Member State's different specific support measures[20].

[19] Before possible blending with oil products such as fuel (as biofuels can also be utilised pure, according to the kind of vehicles which use them), or even as an additive or lubricant. This sub-item also includes the blending phase (where technically there are no specific financial interventions, apart from government policies which change the required percentage for blending).

[20] Policies for R&D are not considered in this section as they aim to influence the paths of technology, production and consumption of biofuels in the future, while this section focuses on policies referring to contemporaneous production and consumption. Of course, given the importance of R&D policies for biofuels of 2nd generation, they are considered later in the report.

Table 10: Support measures to specific sectors applied by Member States.

			Measures for farmers, other than set aside or energy crops	Industry	Distribution	Purchase / maintenance of cars		Green public procurement
2008	Austria	2006					x (1)	
		2007					x (1)	
2007	Belgium	2006	x (2)			x (3)	x	
		2007	x (2)			x (3)	x	
2007	Bulgaria	2006						
		2007						
2007	Cyprus	2006		x		x (4)		
		2007						
2007	Czech Republic	2006		x				
		2007						
2007	Denmark	2006					x	x
		2007						
2008	Estonia	2006					x	x
		2007						
2007	Finland	2006						
		2007						
2008	France	2006						
		2007						
2007	Germany	2006						
		2007						
2008	Greece	2006	x					
		2007	x					
2007	Hungary	2006						
		2007						
2008	Ireland	2006	x			x		x
		2007	x					
2008	Italy	2006						
		2007						
2008	Latvia	2006		x				
		2007		x				
2008	Lithuania	2006	x	x				
		2007	x					
2007	Luxembourg	2006						x
		2007						
2008	Malta	2006					x	
		2007						
2007	Poland	2006	x	x			x	x
		2007	x					
2007	Portugal	2006						x
		2007						
2008	Romania	2006						
		2007						
2007	Slovakia	2006						
		2007						
2008	Slovenia	2006						
		2007						
2007	Spain	2006						
		2007						
2008	Sweden	2006				x		x
		2007						x
2008	The Netherlands	2006						
		2007						
2008	United Kingdom	2006			x			
		2007						

(1) According to a decree of May 11th 2006 car manufacturers are obliged to give detailed information to consumers of passenger cars. It includes the possibility to indicate if the car is warranted for biofuel use or not

(2) The investment support for farmers under the the Flemish Agricultural Investment Fund refers to installations for the production of renewable energy sources.However it does not include production of biodiesel or bioethanol.

(3) City of Brussels has installed 4 own tanks for storage for biofuels.

(4) Tax relief (up to 1200 euro) for the cost of purchasing a new flexible fuel vehicle. It is aimed at the owners of captive fleets.

Source: PwC based on MS reports

Agriculture

In 2006 and 2007, most of the domestic production of biofuels is estimated to come from set-aside areas and areas with energy crop aid[21]. In addition, EU farmers produce a considerable amount of feedstocks for biofuels outside any specific aid scheme related to non-food or energy production.

Table 11: Areas of energy crops within the energy crop aid and set aside scheme (mio ha)

	2004		2005		2006		2007	
Total non food land use on set-aside area	0.5		0.9		1		1	
Energy crop aid	0.3		0.6		1.3		2.8	

Source: European Commission. DG-AGRI

From 2004, in order to enhance the production of raw materials for energy production, farmers have been eligible for the energy crops aid introduced within the framework of the direct payment support. Those crops are supplied essentially for the production of biofuels and electric and thermal energy. The amount of aid (45€/ha) is now granted for a maximum guaranteed area of 2 million hectares. When the claimed area exceeds maximum guaranteed area, a reduction coefficient is established in order to respect budgetary ceiling. This was the case of the year 2007. According to the CAP health check, this aid will be abolished from 2010, as the premium has been effective only in very limited circumstances and has not been an incentive for production[22].

In addition, farmers were allowed to cultivate energy crops as well as other non-food crops on the land set-aside as an exemption from general set-aside obligation[23]. Under this provision it had to be ensured that raw materials harvested were not primarily used for human and animal consumption. Around 1 million hectares of such land was cultivated in the EU for energy purposes in the period 2005-2007. However, in 2008 the set-aside obligation was set to 0% as a response to the high commodity prices in 2007/2008. From 2009 compulsory set aside scheme is repealed as a part of Health check, as the CAP is completing its move away from steering agricultural production.

Apart from these two market instruments, the CAP supports bio-energy including the production and use of biofuels on and near farms through its Rural Development Policy. The Health Check increases funds available to address the new challenges, of which bioenergy is one, by 3.2 billion Euros in 2010 to 2013.

Industry

Industry support measures mainly relate to the localised transformation of the agro-industry. In Cyprus, a grant scheme (which can reach 40% or up to €680,000) finances investments for the production of biofuels for transport. In Latvia support of around €271 per 1,000 litres is given to biodiesel producers up until 2010. In Lithuania an aid scheme entitled "Aid for the Development of Production of Biodiesel" promotes the use of biodiesel for 6 years; manufacturers of rapeseed oil for the production of RME may benefit from direct aid and the overall budget is around €34 million. In Poland the "Long Term Biofuel Promotion Project 2008-2014" is perhaps the most interesting, as it tries to improve the competitiveness of the

[21] Comparison among years should be cautious: 2004/2005 refers to EU 15, 2006 includes EU 25, 2007 tries to estimate the whole EU 27 supply.

[22] Impact Assessment, COM(2008) 306 final

[23] Set-aside scheme has never been applied in new Member States using single area payment scheme (SAPS).

entire biofuel industry chain: cultivation, production, distribution and end-use (one of the measures is corporation tax relief for industry).

Leaving aside the contributions that many governments make to small and medium enterprises operating in poor regions or in rural areas, some aid is provided through regional entities. For example, in the United Kingdom the Scottish Executive and the Regional Development Agencies offer support to operators in the biofuels sector.

Support measures for the distribution sector are provided in a few cases such as in Sweden and the UK. As the Swedish Government relies on the largest filling stations respecting the obligation to blend, a subsidy of up to 30% of investment costs relating to the obligation to provide renewable fuels (under Act 2005: 1248) has been introduced. (However. this subsidy may not exceed the investment cost minus the lowest cost needed to fulfil the requirement). In the UK, the Refuelling Infrastructure Grant Programme, managed by the Energy Saving Trust, provides grants for installing alternative refuelling points, including biofuels (but not exclusively). According to the most recent Report (1 July 2008), the programme has assisted 18 bioethanol (E85) refuelling stations and one E95 bioethanol station.

Interventions are adopted in different Member States to help purchase and maintain specific cars able to utilise a higher biofuels content than the one accepted by car manufactures. In Cyprus there is a tax relief of €1,200 towards the cost of purchasing a new flexible fuel vehicle (including electric and hybrid vehicles). This measure aims to encourage the use of biofuels in captive fleets, especially where fleet owners can produce biofuels from their own resources. The Irish Government has introduced Vehicle Registration Tax (VRT) Relief for hybrid, flexible fuel and electric cars. This is in addition to lower rates of VRT for cars with lower emissions and will last until 31 December 2010. At the end April 2008 2,836 flexible fuel vehicles had been sold in the market. Maybe the most successful purchase policy is that of Sweden where an eco-friendly car sales policy offers lower taxes and subsidises eco-friendly cars[24] purchased by private individuals. Anyone who bought a new eco-friendly car since April 2007 is entitled to a subsidy of SEK 10,000 (€ 938[25]). As a result, the proportion of eco-friendly cars among new car sales increased from 5% in 2005 to almost 30% in 2008.

Public procurement programmes and programmes to raise public awareness are common in many countries. However, they generate few "clean" vehicles and often no room is left to purchase biofuels through continuative long-term contracts. Of course, they are only for demonstration purposes, as the size of the purchase is too small to provide a substantial outlet for the production of biofuels and is too small to trigger economies of scale in the industry.

However, more active policies are pursued in Sweden and Poland. In Sweden from 2007, 85% of cars purchased or leased by state authorities must be eco-friendly and in Poland the "Long Term Biofuel Promotion Project 2008-2014" requires government departments to gradually replace their fleets with vehicles able to use liquid biofuels. Recognising the potential of public procurement as a stimulus for clean vehicle deployment, the Commission proposed a Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles. This was adopted by the European Council and the Parliament during the month of October 2008. The Directive will shortly enter into force and will require public authorities to introduce energy consumption, CO_2 and pollutant emissions as mandatory award criteria into public procurement of vehicles. It applies to public authorities and publicly owned undertakings and to undertakings running public passenger transport services. As a result, not only the initial

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[24] This policy is applied to fuel efficient cars with CO2 emissions of no more than 120 g/km and vehicles that can run on alternative fuels, including biofuels.

[25] Currency conversion on 7 January 2009

first cost of a vehicle, but also the impact it creates during its lifetime on the environment, will be reflected in purchase decisions. Flexibility is provided for local authorities on the detailed implementation.

Support policy costs

Most of the measures Member States have adopted have imposed costs on governments and to a lesser extent on vehicle manufacturers, fuels distributors and consumers. The following table attempts to compare the costs and benefits of the two most common general support measures: tax exemptions and obligations to blend.

Table 12: Comparison of the costs and benefits of tax exemptions and obligations to blend.

Policy measures	Strengths	Weaknesses
Tax exemptions (production increases according to variations in relative prices)	• Easy to implement; • Few market risks; • Incentive for innovation; • Suitable for the early stages of development	• Loss of fiscal revenues; • Risks of overcompensation (if high tax reduction); • Strongly dependent on the initial levels of the excise tax: it is effective where these levels are high
Blending obligations (the produce increases independently from variations in relative prices)	• It injects certainty into the agricultural sector; (unless the subsequent increase in prices significantly penalises the agricultural supply) • It does not involve additional costs for public budget; • Suitable for the more advanced stages of development	• Higher prices for consumers; • Less incentive to innovate; • Higher prices variability; • Difficult to implement and monitor

Source: PwC based on MS reports

It should be noted that in Table 12 the policy measures have been treated as alternatives for easier analysis. However, very often they are implemented simultaneously and therefore interact with each other: increasing the overall effectiveness. Obligations alone involve higher fuel prices at the pump, but at the same time they give certainty to investors and industry, while guaranteeing the achievement of the target. Excise tax exemptions are then introduced to compensate (in part or totally) the extra costs of biofuels, hence leaving the final price at the pump unchanged. Conversely, excise exemptions alone would keep prices at the pump lower, but they would not guarantee the achievement of the desired objectives (both in terms of percentage of blending and reduced CO2 emissions).

A tax exemption reduces fiscal revenues; and as a consequence, lower public resources are available for transfers and services. This loss could be either part-compensated or over-compensated by the global social benefits (i.e. positive externality) of lower greenhouse gas emissions.

In addition to the possible increase in the price of fuel for motorists (an increase which has been partially offset in some countries like France and Sweden due to duty exemptions and other income support measures) the lower energy content of biofuels compared to conventional fuels (the energy factor) should be factored in. According to the UK Department

for Transport, the implementation of the Renewable Transport Fuel Obligation[26] in the UK would bring about an additional annual disbursement of £15-20 (circa € 16-22[27]) and £4-5 (circa € 4-5[28]) for petrol cars and diesel cars respectively, travelling an annual distance of 9,000 miles (circa 14,500 kilometres), due to the accrued amount of fuel needed to travel the same distance as compared to a conventional fuel-propelled car. The additional disbursement for motorists is expected to vary from country to country within the EU depending on which biofuel has a deeper penetration in each Member States' market and the actual percentage of blending.

Conclusion

As Table 13 shows, having both an obligation to blend and a tax relief in combination seems to be the most successful measure for achieving a significant increase in the consumption of biofuels. However, at this initial stage, it should be monitored over the next years that the combination of the obligation and tax relief does not lead to overcompensation.

Table 13: Average annual progress linked to different approaches.

Shift in the measures used to support biofuels:	Average annual growth rate of biofuels (%)
Replacing a tax relief system with an obligation to blend and a tax relief.	70
Remaining with just a tax relief.	63
Remaining with both measures (tax relief and obligation to blend).	49
Replacing a tax relief system with just an obligation to blend.	36

Source: PwC based on MS reports

[26] http://www.dft.gov.uk/pgr/roads/environment/rtfo/
[27] Currency conversion on 7 January 2009
[28] ibid

3.3. Economic impacts

The following economic impacts are covered:

- costs;
- security of supply;
- employment and GDP impacts;
- development and external relations;
- research and innovation.

Costs

The biofuels progress report of 2007 estimated the cost (compared to fossil fuels) of a 7% or 14% share of biofuels under various framework conditions.

Estimates of the cost of a 10% share can be derived from these figures. These show that the extra annual cost of this biofuel use in 2020 can be estimated at €8.8-11.2bn (with oil at $48/barrel) or at €4.3-7.6bn (with oil at $70/barrel).

These figures are based on data from the authoritative JEC well-to-wheels study[29]. Updated cost figures from this source are expected soon but are not expected to indicate a dramatic change in the picture.

These data show how critically the cost of biofuel promotion depends on commodity prices. Even though 2008 saw record high oil prices, at times reaching 140$/barrel, preference here has been given to more conservative oil price assumptions. The same goes for agricultural commodity prices which also reached high levels in spring 2008, but have since gone down.

Overall, the introduction of biofuels remains more costly than other CO_2-abatement technologies in other sectors, but with today's technologies it still remains one of the few available solutions to curb the growing CO2 emissions of the transport sector. It is essential for further technology development to aim to reduce the production costs of biofuels.

Security of supply

Security of supply has been one of the two principal reasons for adopting the EU targets for renewable energy use in transport, alongside the greenhouse gas benefits. Presently, about 88% of the global energy mix comes from depleting fuels and, with the exception of the nuclear energy (6%), all are carbon-rich fossil fuels such as oil (35%), natural gas (21%), and coal (26%) (World Energy Statistics 2008, International Energy Agency (IEA)).

Based on the data provided in Member States' reports, in 2007 the use of biofuels in the EU replaced **1593.1 million litres of petrol and 7729.9 million litres of diesel.** Currently that represents less than 3% of the total EU fuel consumption in road transport. The target for renewable energy in transport in 2010 has been set at the level of 5.75%, but with the new Renewable energy policy framework it will raise to 10% in the next decade.

Several studies have estimated that from a strict supply-security perspective, increasing global demand for biofuels could reduce crude oil prices slightly. Banse et al. (2008) estimated that under an "increased global biofuel" scenario (with a 10% biofuel target in the EU and comparable targets in the US, Brazil, South Africa, China, India and Japan), the crude oil

[29] Well-to-Wheels analysis of future automotive fuels and powertrains in the European context, WELL-to-WHEELS Report: http://ies.jrc.ec.europa.eu/WTW

price would decline by 1.5 per cent.[30] Similarly, Dixon *et al*. (2007) estimated a decline in the world crude oil price of 4.5 per cent due to US biofuel policies[31].

Employment and GDP

According to JRC (2007)[32], achieving the EU's 2020 10% renewable transport fuel target would create additional employment estimated at €1.8 billion in distributed salaries over the 2007- 2020 period.

The development of the biofuels industry will mostly benefit rural areas. The Commission estimated in its previous biofuels progress report[33] that a 10% biofuels market share produced from home grown feedstock would lead to a net increase in the EU of 150.000 jobs and an increase in EU GDP of at least € 25 billion, equal to 0.17% of current GDP.[34]

The ongoing "EmployRES" study, commissioned by the Commission, has found that among all renewable energy technologies the largest employers in the EU were the biomass and biofuels sectors (data on 2005)[35]. Out of a total 1.4 million people employed in the renewable energy sector, non-grid biomass use accounts for 600,000 employees, biomass grid and biofuels contributed over 100,000 employees and biogas around 40,000. This is because the biomass and biofuel sectors are more labour intensive than other renewable energy technologies. In addition, agriculture and forestry play an important role in supplying the fuel for biomass technologies. Agricultural activity related to the renewable energy sector generates gross value added of well over €9bn per year. The value added from increased renewable fuel use was estimated at around €14.6 billion in 2005 and the value added of the renewable energy sector overall is around €57 billion in 2005 or 0.5% of total EU-27 GDP

A recent UNEP and ILO report: *Green Jobs*[36] estimated that in 2007 the total world investment in renewable energy reached $66 billion, equivalent to 18% of all energy investment and could reach $343 billion by 2020. These investments would translate into at least 20 million additional jobs world-wide; a large proportion in biomass and biofuels, including jobs in developing countries. This would make the sector a much larger source of employment than today's fossil energy industry (mining. petroleum extraction. refining and fossil power generation); which, in spite of rising production, has been shedding jobs due to technological advances.

The increase in biofuels production, apart from stimulating agricultural production and research and development, will trigger additional investment in bio-refinery plants and the adaptation of conventional fuel refineries (new facilities for storage and blending purposes) and petrol filling stations (additional tanks and new pumps for pure biofuels or high-percentage biofuel blends). These investments will create new jobs both directly (mostly in bio-refinery plants) and indirectly through the investments multiplier effect. Moreover,

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30 Martin Base, Hans van Meijl, Andrzej Tabeau and Geert Woltjer *Will EU biofuel policies affect global agricultural markets?*, LEI, Wageninningen UR, 2008

31 Dixon, P.B., Osborne, S. and Rimmer, M.T. *The economy –wide effects in the United States of replacing crude petroleum with biomass*, June, 2007

32 Biofuels in the European Context: facts, uncertainties and recommendations JRC working paper, December 2007

33 Biofuel Progress Report, Review of economic and environmental data for the biofuels progress report, Commission Staff Working Document, Sec (2006) 1721.

34 Renewable Energy Roadmap impact assessment.

35 Employ RES project: Employment and economic growth of sustainable energies in the European Union led by Fraunhofer ISI (An ongoing study commissioned by European Commission , DG TREN).

36 Green Jobs, by UNEP, ILO and others, produced by Worldwatch Institute, September 2008

personnel already employed in the conventional fuel industry will need re-training to deal with the handling, blending and commercialization of biofuels.

Development and external relations

As noted earlier, it is likely that the growing biofuels demand will be met in part through imports. Prospective access to European markets has considerably increased developing countries' interest in biofuels. At the same time, rising food prices have also created concerns about the sustainability of biofuels production and its impacts on food availability in world's poorest regions. Although, it is important to point out that prices have subsequently fallen back, at present it is not possible to predict with sufficient accuracy their future trends.

The rise in demand for biofuels and current biofuel support policies have sometimes been suggested as key factors in food price increases, especially in the wake of commodity price increases in the first half of 2008. In its Communication on high food prices[37] adopted on 20 May 2008, however, the Commission found that current EU biofuel production and the new 2020 10% renewable transport fuel target had little impact on current global food prices. This was because biofuels use less than 1% of EU cereal production and long lead-times make it unlikely that they could have had an impact on today's prices.

These findings were confirmed in another communication on *Food Prices in Europe* adopted on December 2008 following additional analysis on the reasons behind recent food price fluctuations. In this communication the Commission confirmed that that the surge in agricultural commodity prices resulted from a combination of structural and temporary factors, among which, the emerging biofuels market had a rather insignificant impact[38].

In order to respond to the food price concerns and to create additional safeguards against possible negative impacts, the newly established biofuels sustainability scheme in the Renewable Energy Directive contains a set of monitoring and reporting requirements, including food price and food availability impacts in the EU and third countries, which are significant sources of biofuel imports into the EU.

According to Faaij[39], bioenergy production will nearly always compete with food production including feed. However, improved bioenergy production systems that allow for synergies with food production exist and can provide significant benefits. For example, intercropping jatropha with annual food crops can potentially increase food yields, while at the same time producing biomass for energy; and agro-forestry systems can deliver both food and biomass for construction, fibre and fuel use, as well as secure high levels of biodiversity.

The relationship between bioenergy and food production depends on developments in the agricultural sector and consequent variations in agricultural productivity. Higher prices for food products or strategies to stimulate development in agricultural management might lead to an increase in agriculture efficiency as increased demand leads to higher investments. As a result, food production could improve using less of the resources at hand for the production of a given amount of bioenergy.

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37 Commission's Communication *Tackling the challenge of rising food prices,* adopted on 20 May 2008, COM(2008) 321 final

38 Commission's staff working document "Monitoring prices developments" (SEC(2008)2970) accompanying Communication on *Food prices in Europe,* adopted on 9 December 2008, COM(2008) 821

39 André Faaij: Bioenergy and global food security, 2008

In 2007, about one fourth of biodiesel and almost a third of bioethanol consumed in the EU was imported. Most of those imports came from Brazil and the USA. South Africa and the Democratic Republic of Congo also exported some bioethanol to the EU.

The EU has developed a Free Trade Agreement Partnership with a bloc of East African Countries by negotiating Economic Partnership Agreements (EPA) on a bilateral basis and the negotiation of an EPA is underway with Tanzania. EPAs will affect policy development in those countries and the biofuels feedstock sector may be influenced. EPAs could be strategic for the EU biofuels policy, given the remarkable potential of East African Countries to produce jatropha. Particularly favourable land properties and climatic conditions for the production of jatropha are already attracting Foreign Direct Investments to East African Countries (Tanzania and Ethiopia in particular).

Currently no specific classification and dedicated tariff lines exist for biodiesel and bioethanol The former is classified as "other chemicals." while the latter is an agricultural by-product. This situation could change in near future, if and once a dedicated tariff line is established for biodiesel.

The current tariff regime on biofuel feedstock and biofuel also has some impact on the biofuel prices in the EU. Although the Most Favoured Nation (MFN) tariffs on ethanol are very high and generally higher than those applied to biodiesel. African, Caribbean and Pacific (ACP) countries (except South Africa), the Least Developed Countries (LDCs) and all those countries eligible for the Generalized System of Preferences Plus (GSP+) tariffs can benefit from duty free and quota free access to the EU market for ethanol. The new GSP system (effective from January 2006) also allows Pakistan unlimited access to the EU ethanol market.

Current biofuels imports are not subject to any formal sustainability requirements, although a number of voluntary certification systems do exist. This will change with the entry into force of the new biofuel sustainability scheme included in the Renewable Energy Directive. Biofuel producers, fuel distributors and Member State authorities will be held responsible for the entire production chain of biofuels, whether domestically produced or imported.

Research, innovation and promotion of second generation biofuels

According to the IEA's 2006 World Energy Outlook[40], the cost of producing biofuels has reduced by 5-10% over the last 10 years and the costs of producing bioethanol and biodiesel are expected to diminish by a further 25-50% and 20-25% respectively over the next 10 years. According to the same study, the cost of producing biodiesel in Europe is projected to drop from US$0.60/litre to US$0.40/litre by 2030 due to the economies to scale achievable by using bigger plants. The cost of bioethanol production is projected to drop by around 30% by 2030 compared to its cost of production in 2005. Such improvements depend on research and development and the rate of growth of the production capacity of biofuels plants.

According to the same source, the cost of producing second generation biofuels (such as enzymatic hydrolysis and gasification of lingo-cellulosic biomass) is likely to drop to $40-50/barrel[41] in the decades to come making biofuels competitive with conventional fuels by 2030[42].

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40 Source: IEA, World Energy Outlook (2006).

41 Source: IEA, World Energy Outlook (2006).

42 The price of crude oil that has been assumed in the WEO (2006) for 2030 (reference scenario) is $ 97,30 per barrel.

Another view can be obtained by assessing the demonstration plants that have been built in Germany to test the production of diesel via Fischer-Tropsch synthesis[43]. As of 2006, the cost of producing biodiesel through this technology was $0.90/litre, with the perspective to reduce it to $0.70-0.80/litre in the long-term[44].

Under the Sixth Framework Programme (2002-2006) almost €35 million were made available to support the research and development of biofuels, of which €5 million for the development of second generation biofuels technologies.

In the Seventh Framework Programme €59 million have been allocated for biofuels in the first two calls in 2007 and 2008. The largest part of this amount - €51 million or 86% - has been allocated to 2nd generation biofuel technologies. Furthermore in 2009 an additional €15 million will be allocated to bio refinery projects[45].

In addition, Member States support national research programmes in biofuels technologies. For instance, Denmark has focused its efforts in financing research in ligno-cellulosic processes to produce bioethanol from the waste from agriculture, forestry and the timber industry. Spain has launched the CENIT biodiesel initiative, a four-year research and development project managed by the private sector and financially supported by the Government, which aims to identify new raw materials and to develop new processes and technologies to produce biodiesel.

3.4. Environmental impacts

Assessment of the life-cycle greenhouse gas impact of biofuels

The analysis presented here assesses the greenhouse gas savings due to EU biofuel consumption.

The analysis was based on the most recent JEC data on typical greenhouse gas reductions.

Member States' data on biofuel production/consumption were disaggregated, as far as possible, by feedstock[46] and JEC typical greenhouse gas values were applied to determine the amount of greenhouse gas savings for each type of feedstock for each Member State. Reflecting the future requirements of the Renewable Energy Directive, the analysis was done in duplicate, using both the energy allocation method and the substitution method to account for co-products.

At an aggregated level, the EU-27 had a biofuel share of 2.6% in 2007 and an average greenhouse gas saving, relative to the fossil fuels replaced, estimated at 49% (energy allocation method) or 48% (substitution method).

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43 See Kutas et al

44 2nd generation biofuels based on the gasification of biomass to produce liquid fuel, seem to be a promising way to obtain significant greenhouse gas savings. Across Europe, different Biomass to Liquid (BtL) technologies are under development. Table 26 in Annex D summarises the BtL plant projects planned by the RENEW project partners. Based on the announced plans of companies developing 2nd-generation biofuel facilities, the first fully commercial-scale operations could possibly commence as early as 2012. However, given the complexity of the technical and economic issues involved, the first commercial plants are unlikely to be deployed before 2015. Therefore, at present, it is difficult to estimate the potential greenhouse gas emissions savings from increased share of 2nd generation biofuels.

45 These budget allocations only refer to the biofuel and biorefinery support projects managed by DG TREN. A part of energy budget under Sixth and Seventh Framework programmes is managed by DG RTD.

46 Source: PwC data based on Member State's reported feedstocks

Focusing on the physical savings in terms of CO_{2eq}, the 5611 ktoe of biofuels consumed in 2006 and 8105 ktoe consumed in 2007 can be translated into greenhouse gas emissions savings. The life cycle greenhouse gas emissions associated to traditional fuels is 83.8 gCO_2/MJ (energy allocation method). If the above mentioned coefficients are applied, in 2006 and 2007 respectively 19.7-20.3 and 28.4-29.4 Mt CO_{2eq} which would have been emitted in the atmosphere from fossil fuels, have been avoided. However this gross saving exaggerates the benefits, since emissions from the production of biofuels should be deducted. The net saving can be calculated by multiplying these gross savings by the average percentage of emissions saved by biofuels (48%-49%). One can then calculate the net savings achieved in the European Union from biofuels placed on the market and consumed:

9.7 (energy allocation/substitution) Mt CO_2-eq. in 2006

14.1 (energy allocation) / 14.0 (substitution) Mt CO_2-eq. in 2007[47].

Land use

Most biofuels are made from crops. The promotion of biofuels therefore leads to an increase in demand for agricultural commodities. Such increases in demand can be met through increased land use for agriculture or through increased yields from land already in agricultural use. If the increase in demand is partly met through land conversion and if the land converted has a high carbon stock, this process would lead to greenhouse gas emissions that offset the greenhouse gas benefits from the use of biofuels.

In the EU, arable land has been falling out of agricultural use for decades. That process is continuing. In terms of land use, the main effect of EU biofuel consumption has been the re-use of recently abandoned agricultural land, or a reduced rate of land abandonment. Recently abandoned agricultural land does not have a high carbon stock. It follows that to date. EU biofuel consumption is not likely to have caused significant damaging land use change. In fact, it is more likely to have brought benefits in this respect, since the crops used in the EU for biofuel production produce, at the same time, significant quantities of co-products that are used as animal feed. This mainly replaces animal feed from soya, which has been associated with damaging land use change notably in Latin America.

For the future, biofuels from certain defined types of high carbon stock land will not count towards the targets in the Renewable Energy Directive and will not be eligible for public support. Moreover, the greenhouse gas calculation methodology in the Directive will ensure that the carbon stock cost of converting other types of land is fully taken into account. Since it is expected that biofuels fulfilling the sustainability criteria will command a premium price, these measures will tend to increase producers' reliance on yield increases rather than land use increases to meet increased demand.

This does not rule out the possibility of increased demand for agricultural commodities for biofuels leading to an overall increase in the damaging conversion of land, even if the biofuels themselves do not come from this land. The Directive therefore requires the Commission to report, by 2010 at the latest, on how best to address this issue.

Other environmental impacts of biofuels

The production of biofuel feedstock can have environmental effects beyond the impacts on greenhouse gas emissions, such as impacts on biodiversity, water consumption, water quality and soil quality. The extent and character of these impacts varies according to factors such as

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[47] The figures are derived by the JEC method, which is not a real substitution method, which would not be possible to use for fuels produced in refineries.

agro-climatic make up; land-use patterns; feedstock; rainfall patterns; scale of production; and long and short time scales.

Biodiversity

Published studies on the biodiversity impacts of growing bio-energy crops are diverse and have conflicting results. This is due to the different time horizons (short or long term) and scales of observation (local. regional or global) used.

Therefore, the integral global impacts of biofuels on biodiversity depend mainly on the long-term positive effect of reduced future climate change and the short-term negative effect of land-use change for large scale energy crop cultivation rather than nature. In determining whether short-term losses can be balanced by long-term gains, uncertainties should be taken into account[48].

Water consumption

The ideal study on biofuel impacts on water consumption does not exist as several diverging aspects have to be considered. Water availability and water use can be assessed at a crop, farm, river basin, continental and global scale. Each scale has its own parameters for reliable calculations and estimates and its own assessment targets. Water use for bioenergy production has to be compared with actual water use and existing or expected bottlenecks for water availability need to be identified. As priority is often given to the other uses (food, domestic and industrial water use), all uncertainties and inaccuracies accumulate in the final assessment of the scope for energy crops.

Different studies show that in some regions abundant water availability provides ample opportunities for energy crop production, while water scarcity in other regions is seriously restricting any opportunity for energy crops.

A rough estimate of available blue water for energy crops, based on global water flows, is 1,300 to 5,000km³, depending on the share required for environmental water requirements (50-20%). However, whether this water is available and can be used cannot be determined based on available studies. Future change in rainfall patterns will have a large impact regionally[49].

Water pollution

Producing more biofuels crops may affect water quality. For example, if (unlike the current EU experience) additional demand for biofuels were to be met by converting pastures or woodlands into crop fields, this could exacerbate problems such as soil erosion, sedimentation and excess nutrient run-off into surface waters and infiltration into groundwater from increased fertilizer application. Pesticides and other chemicals can wash into water bodies negatively affecting water quality. However, it is worth noting that different biofuel feedstock differ markedly in their fertilizer and pesticides inputs per hectare. For example, high-diversity prairie biomass is estimated to require only a fraction of the nitrogen, phosphorus and pesticides required by maize with correspondingly lower impacts on water quality[50].

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48 Climate change, scientific assessment and policy analysis, biomass assessment, assessment of global biomass potentials and their link to food, water, biodiversity, energy demand and economy, Main report. January 2008. Editors Erik Lysen Sander van Egmond.

49 Climate change, scientific assessment and policy analysis, biomass assessment, assessment of global biomass potentials and their link to food, water, biodiversity, energy demand and economy, Main report, January 2008. Editors Erik Lysen Sander van Egmond

50 FAO, the State of Food and Agriculture, Biofuels: prospects, risks and opportunities, Rome, 2008.

Soil resources

Both land-use change and intensification of agricultural production on existing croplands can have significant adverse impacts on soils, but these impacts (just as for any crop) depend critically on farming techniques. Inappropriate cultivation practices can reduce soil organic matter and increase soil erosion by removing permanent soil cover. The removal of plant residues can reduce soil nutrient contents and increase greenhouse gas emissions through losses of soil carbon. In the EU, production of rape seed for biofuels has tended to diversify crop rotations, with beneficial effects.

On the other hand, conservation tillage, crop rotations and other improved management practices can, under the right conditions, reduce adverse impacts or even improve environmental quality in conjunction with increased biofuel feedstock production. Growing perennials (such as palm, short-rotation coppice or sugar cane) instead of annual crops can improve soil quality by increasing soil cover and organic carbon levels. In combination with no-tillage and reduced fertilizer and pesticide inputs, positive impacts on soil resources can be obtained[51].

Air quality

Prospective biofuels offer a number of distinct advantages relating to air pollution. Blending bio-diesel with conventional diesel in engines results in substantial reduction of un-burnt hydrocarbons, carbon monoxide and particulate matters (the only negative is a NOX value which is higher). Biodiesel also contains no aromatic compounds. Current EU diesel requirements set a maximum sulphur content of 10ppm. There is no clear evidence of any increase in efficiency or reduction in GHG emissions. However the Commission is currently studying these issues.

[51] FAO the State of Food and Agriculture, Biofuels: prospects, risks and opportunities, Rome, 2008.

Conclusion

From an environmental perspective, it is estimated that. the current achieved net greenhouse gas savings achieved in the European Union from biofuels placed on the market and consumed (in 2006 and 2007) amounted to 23.8 Mt CO_2-eq. This takes into account the estimated impact of associated land use change, bearing in mind that most EU biofuel consumption has been fulfilled through the re-use of recently abandoned agricultural land or through slowing down the rate of land abandonment.

Turning to broader environmental impacts, biofuel production contributes to an increased extent and intensity of agricultural production in the EU. This can have both positive and negative environmental effects. In particular, increased pressure on the use of land with high biodiversity value and soil carbon stock may be expected, together with a higher incentive to use more fertilizer per hectare. On the other hand land abandonment should slow down, particularly in disadvantaged and environmentally sensitive rural regions. This should have a positive effect in terms of erosion and fire prevention, landscape and biodiversity maintenance. The Commission is not aware of specific reasons for concern in relation to the impact of biofuels in this respect. However, under the new Renewable Energy Directive, economic operators and Member States will be required to report in more detail on the land use changes and other environmental impacts from increased production of biofuels.

While this analysis confirms the positive impact of the policy to date, the last progress report made it clear that it is essential for the further expansion of biofuels to be accompanied by the introduction of appropriate sustainability criteria. Such criteria are included in the new Renewable Energy Directive, covering minimum requirements for greenhouse gas savings, requirements to avoid damaging land use change and reporting requirements covering a wide range of environmental and social issues.

3.5. Further measures needed in the transport sector

Under the provisions of Directive 2003/30, this progress report should review options other than biofuels for improving energy efficiency in transport.

Any measure aimed at improving the environmental performance of new cars (from increasing their energy efficiency to substitution with hybrid, electric or hydrogen vehicles) will affect greenhouse gas emissions and fuel consumption of the new European car fleet. The average number of new registrations between 2003 and 2007, was 15.2 million passenger cars/year compared to a stock of 230 million cars in 2006. Measures aimed at reducing the consumption of the whole stock of cars, like “eco-driving”, increasing car occupancy rates and improving traffic infrastructures have a larger potential in terms of greenhouse gas emission and fuel saving, but require a coordinated effort at local, regional and central government levels in terms of policies, support and communication.

The following table provides an estimation of possible greenhouse gas emissions savings, fossil fuel savings and monetary cost and benefits of different "green transport" measures.

Table 14: Summary of options concerning energy efficiency measures in transport.

Measure scope	Measure detail	GHG saving (MtCO2)	Fossil fuel saving (Mtoe)	Monetary costs and benefits
New passenger cars	Increasing the efficiency of ICE cars from 160 to 130 g CO2/km and from 6.4 to 5.2 l/100 km consumption	3.7 to 5.4 in 2012	1.2 to 1.76 in 2012	Saving of up to 200€/year for drivers due to reduced consumption Additional cost of 3500€/car for the 120gCO2 /kmtarget or 2500€/car for the 130gCO2/km over a period of 6 year[52]
	Hydrogen (only zero carbon hydrogen considered here)	Up to 15 MtCO2 saved in 2020 in the hypothesis of 5% new cars fuelled by zero carbon Hydrogen	.Depending on how hydrogen will be generated.	Additional cost per vehicle of €5-10000. Between €2 and €3 per 100 km[53]
	Electric Cars	Depending on where the electric energy is sourced	Depending on where the electric energy is sourced	Electric vehicles may cost up 2-3 times more than conventional ones. Cost may be greatly reduced by mass production. Batteries to be replaced every 2-3 year at the cost of €2300-4000.[54]
	Hybrid vehicle. in the hypothesis of 50% penetration of new cars in 2012 (3.% of the whole stock)	2.7 to 3.9 additional to 1)	0.36 to 0.53 additional to 1)	Additional cost per vehicle of around €3,100 Saving of up to €280 year for drivers due to reduced consumption[55]
Whole passenger car stock	Eco-driving	50 MT as theoretical potential	Long term effect of 7% saving under everyday driving conditions	Saving of up to 128€/tCO_2 due to reduced consumption.[56]
	Increase of car occupancy rate (assumption of a 0.05 increase of the Car	25 MT	8 Mtoe[57]	

52 PwC calculation based on the assumption of an average mileage of 15000 km/y per vehicle and from ACEA 2007: Reducing co2 emissions from cars: towards an integrated approach

53 EUCAR, JRC, CONCAWE (2007), Well-to-wheels analysis of future automotive fuels and powertrains in the European context; DGTREN, 2003, Hydrogen Energy and Fuel Cells A vision of our future, p.15; http://www.hyways.de/. HyWays presentation, 8 May 2007)

54 Electric Auto Association Europe: http://eaaeurope.org/emissions_of_eas.html)

55 PwC calculation obtained by comparing the average performance of vehicles belonging to the most common and representative cluster in Europe with the performance of the hybrid model belonging to the same category by body type and cubic capacity: Honda Civic Hybrid as 2/4 Door Sedan up to 1500cc and Toyota Prius as 5 Door Sedan up to 1500cc; Sources: Clean Green Cars Website: http://www.cleangreencars.co.uk/, Quattrouote Website: http://www.quattroruote.it/; "Alternative Fuels: An Energy Technology Perspective" IEA/ETO. Hybrid Cars Website: http://www.hybridcars.com

56 ACEA 2007: Reducing CO2 emissions from cars: towards an integrated approach

57 PWC calculation on the basis of data from ICARO: (Increasing Car Occupancy): A Research And Demonstration Programme On Car-Pooling, European Commission DG VII, 1999) and from DG-TREN data (DG-TREN 2008.EU energy and transport in figures Statistical pocketbook 2007/2008

	Occupancy Rate)			
	Improvement of traffic lights	Up to 2.4 MT/y [58]		
Increase Biofuel consumption up to 5.75%	1st generation	25.7 MT	18.3 Mtoe[59]	
	2nd generation	In 2020		

Source: PwC

In the two years since the last biofuels progress report, the Commission has taken a number of initiatives to make the European transport sector greener. The new CO_2 emission reduction strategy, including specific targets for all new cars sold in the EU, was adopted by the Commission on 31 January 2007[60]. On the same date, the European Commission also proposed to revise the EU Fuel Quality Standard. Both of these proposals, which were endorsed by the Council and Parliament in December 2008, will enable the EU to reach its long-established objective of limiting average CO2 emissions from new cars to 120 grams/km by 2012. This will not only reduce CO2 emissions by around 25% from 2008 levels but will also improve fuel efficiency, delivering substantial fuel savings for drivers.

4. THE IMPLEMENTATION OF THE BIOMASS ACTION PLAN

According to the latest data available from Eurostat[61], 88 Mtoe of biomass was consumed for energy purposes (primary energy consumption) within the EU-27 in 2006, representing an 8% increase from 2005. In terms of final energy consumption, around 58 Mtoe was consumed in 2006- around 5% of total energy consumption[62].

This achievement is still **a long way from reaching the EU's biomass potential** identified in the EU Biomass Action Plan.

Biomass for electricity (including biogas) and biomass for transportation fuels have grown faster than biomass for heat, due to clear targets set for renewable energy used in transport and electricity. Electricity production using solid biomass has increased annually at a rate of around 10% since 2004. The EU owes this increase principally to the development of electricity resulting from co-generation (combined heat and power) in Germany, Finland and Sweden and in particular to the use of biogas in cogeneration, which represented around 60% of electricity production from biogas in 2007[63].

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58 ACEA 2007: Reducing CO2 emissions from cars: towards an integrated approach

59 PWC calculations based on GHG values contained in the EU Commission Proposal for a Directive on the promotion of the use of energy from renewable sources (January 2008)

60 Communication from the Commission to the Council and the European parliament, 2007. Results of the review of the Community Strategy to reduce CO2 emissions from passenger cars and light-commercial vehicles.

61 2006

62 Primary energy consumption refers to the consumption of energy sources like biomass before conversion to other forms of energy (electricity, heat, transport fuel), and final energy consumption refers to energy consumed after conversion into other forms of energy and excludes the use of energy sources for non-energy purposes, such as self-consumption by power plants and losses.

63 Biogas Barometer, No 186-2008

4.1. Availability of biomass

Projections using modelling by PRIMES[64] and Green X[65] estimate that around 165-195 Mtoe of biomass would be used in 2020 to achieve the 20% renewables in primary energy target. The Environment Energy Agency (EEA) report of 2006[66] concluded that significant amounts of biomass can be theoretically available to support ambitious renewable energy targets. 190 Mtoe in 2010 and 235 Mtoe in 2020 is deemed feasible even if strict environmental constraints are applied (e.g. no conversion of permanent grassland), although the report does not look at the economics of harvesting/producing the additional biomass resources or at the measures needed to ensure that this potential is realised.

Many other studies have assessed biomass resource availability in the EU-27. A European Commission funded review of over 70 studies[67] found that total 2020 potentials estimated for the EU-27 differ to a considerable degree: 76 Mtoe - 480 Mtoe. The wide range is mainly due to ambiguous and varying methods of estimating biomass production and different assumptions that influence potentials (such as land use for food and fibre purposes).

Further studies are being carried out in the meantime, in particular to better estimate the potential wood supply in the EU. In addition, the increasing potentials and benefits for using biomass wastes and forest and agricultural residues and of new innovative processes such as bio-refineries should not be underestimated. However, any risks of overuse of forests should be assured and all EU Member States have signed up to the Ministerial Conference on the Protection of Forests in Europe (MCPFE), where the guiding principle is sustainable forest management.

Any policy or action plan to increase the use of biomass must therefore ensure a certain degree of harmonisation of information and data on biomass so as to improve the accuracy and comparability of future biomass resource assessments.

4.2. Actions taken to increase the availability and use of biomass

National biomass strategies have a key role in achieving the 20% renewable energy target, ensuring the long-term, sustainable supply of biomass resources and in increasing investor confidence in biomass and biomass technologies. One of the main actions identified in the EU BAP was to encourage Member States to develop *national* Biomass Action Plans. An expert group[68] was set up in 2006 to discuss how to achieve a coherent and coordinated approach on bioenergy and to share experiences on national approaches to data collection, on support schemes etc.

Another important element is addressing the different uses of biomass as these resources can be used for a variety of purposes and in a variety of ways, some of which are more efficient than others. The International Risk Governance Council[69] agrees that the trade-offs involved in making decisions regarding bioenergy policies are context-specific and. Therefore, require different approaches in different countries. Governments therefore must design and

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64 SEC(2008)85 Annex to the Impact Assessment accompanying the package of implementation measures for the EU's objectives on climate change and renewable energy for 2020

65 COM(2006)848 Biomass Action Plan

66 EEA (2006) "How much bioenergy can Europe produce without harming the environment". See also UNECE/JWEE 2008 study on potential wood supply.

67 Biomass Energy Europe "Status of Biomass Resources Assessments Version 1", 19 December 2008 available at: http://www.eu-bee.com/

68 For more information see: http://ec.europa.eu/energy/renewables/bioenergy/bioenergy_en.htm

69 IRGC (2008) Risk Governance Guidelines for Bioenergy Policies

implement policies according to their energy needs, available resources (particularly land and water) and economic development.

Activities under the EU's Forestry Action Plan have been instrumental in bringing forward proposals on necessary elements for a national action plans. In that context, the EU's Standing Forestry Committee[70] advocates Member States to develop a strategy on mobilisation and efficient use of wood[71]. The Commission's Communication on innovative and sustainable forest based industries[72] asks that Member States pay attention to the different uses of biomass when developing the national action plans.

To account for the EU's new energy challenges the Health Check of the Common Agricultural Policy[73] made available additional funds for bio-energy under the European Rural Development Fund (EAFRD), an increase of 3.2 billion Euros for 2010-2013. By mid-2009, Member States will have to revise their national rural development plans and programmes taking into account the new challenges, including biomass for energy from agricultural and forestry sources.

To date, **only five Member States have officially submitted their national biomass action plans** to the Commission (Estonia, Ireland, Netherlands, Spain and the United Kingdom). Regional biomass plans have also been submitted by Scotland, by the Central Finland region, North Karelia and by Northern Ireland and the South-East region of Ireland.

All the submitted biomass action plans seek to assess their biomass resources and potentials for energy production from forestry, waste and agricultural biomass. However, these resources and potentials can barely be compared since the data is presented in various units and in a non-standardised way.

The national biomass action plans propose various objectives for biomass use in different sectors (electricity, heating and transport) but the relationship of these sectoral targets to the Member State's overall renewable energy target is not clear. Measures for mobilising new biomass resources are not given great consideration in any of the action plans, but on the other hand the importance of biomass imports is acknowledged. Such an approach will not be sustainable at EU level, unless countries or regions can be sure that the biomass imports they rely on will be available.

To ensure that there is an overview of the availability of resources and of measures to promote the production and use of biomass resources, the Commission will provide a template for developing renewable energy action plans by June 2009. In particular, it is considered useful that the development of these plans is carried out with the involvement of relevant stakeholders at local, regional and national level. The regions which have submitted their biomass strategies have considered issues important at the local level, such as adequacy of manpower to reach objectives, the need for investments in equipment and logistics and analysis of technologies that are suited to local conditions.

The "Intelligent Energy Europe II Programme"[74] identified good practices for promoting bioenergy in EU Member States, which show that an adequate legal framework should go hand in hand with appropriate support schemes. Germany uses a 'market incentive programme' for leveraging the installation of small-scale biomass heating systems, especially

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70 http://ec.europa.eu/agriculture/minco/othco/forest/index.htm

71 Report on mobilisation and efficient use of wood and wood residues for energy generation available at:

72 COM(2008)113

73 Regulations (EC) 72/2009, 73/2009, 74/2009 O.J. L30.

74 http://ec.europa.eu/energy/intelligent/index_en.html

pellet boilers, while Sweden imposed a carbon tax to provide long term and stable incentives for bioenergy. France focuses on supporting specific regional programmes such as the "wood-fuel and local authorities programme", promoting regional development and mobilisation of wood for heating purposes, which triggered the construction of 1,764 wood heating plants (1,170 MW installed power). The success of these programmes is due to the continuity of the policy and support schemes by the state and/ or the region[75]. To support such schemes at regional and local level, approximately €1.7bn from Community funds under Cohesion policy will be mobilised for biomass investment between 2007 and 2013.

4.3. Barriers to the uptake of bioenergy

There are still several administrative barriers that hinder the development of bioenergy plants within EU Member States. The Commission carried out a study on benchmarking bioenergy permits[76], looking at the length of time it takes to get a permit in the EU and the factors affecting the success or failure of getting a permit (which can also mean authorisation or license to perform an activity). While several countries have put in place integrated permitting procedures and apply the "one-stop shop principle", most bioenergy projects require several permits steps (in France. Italy and Germany, 1-4 permits are required, whereas in Spain. Romania and Poland, around 6-8 permits are required).

Most individual types of permits and licenses across Europe take a relatively short time to obtain (a few weeks). Hence, the long timeframes for getting permits are often caused by the serial nature of the various permits and cross-authorisation. In general, the land use permit (in case of land use change), the environmental permit, in case the project requires an EIA, the operational permit and the legal process (in case of higher appeal) last the longest and dominate the duration of the project.

On average, gaining a permit takes about two years or three years for the larger biomass projects which include an EIA. However, it has also been identified that many projects simply fail to get a permit. The permit application failure rate exceeds 30% for bioenergy plants. This is influenced by many factors, including the relative expense associated with obtaining all the necessary permits (in particular for biogas and co-digestion plants) but in general because of local objections. The legal process through which appeals or objections can be made often do not have mandatory or clear timeframes. Around one third of the analysed cases failed because of local objections to bioenergy installations, in particular to co-firing, biogas and biofuels plants.

The cost associated with getting a permit is not significant in most cases and permits for large power plants are not necessarily more expensive than for small size plants. Typically, the costs are well below 1% of the investments with the exception of the dedicated biogas plants where costs are in the order of 1-5% of the investment costs. However, where there is a complex framework of legislative acts, the applicant sometimes has to apply for several permits simultaneously in order to fulfil environmental, agricultural, tax, waste etc. permitting requirements, leading to high cumulative costs.

It is therefore recommended that a clear legislative framework is developed for permitting procedures of bioenergy installations where the role of authorities and timeframes are clearly defined. Coordination between permitting bodies is also advised.

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75 BAP Driver – European Best Practice Report, available at: http://www.bapdriver.org/

76 Ecofys and Golder Associates: Benchmarking Bioenergy Permits, 2008

4.4. Implementation of the thirty-three actions of the Biomass Action Plan

The Commission's Biomass Action Plan contained a number of actions to be undertaken by the Commission and by Member States. The following table provides a summary of the actions and the state of their implementation.

Action	State of implementation
Heating and electricity	
1) work towards a proposal for Community legislation in 2006 to encourage the use of renewable energy, including biomass, for heating and cooling	The new Renewable Energy Directive, based on COM(2008)19, includes the heating and cooling sector. Each Member State will have to set sectoral targets and outline in their National Action Plans how they plan to promote the heating and cooling sector and the use of biomass to reach national renewable energy targets.
2) examine how the directive on energy performance of buildings (EPBD) could be amended to increase incentives for the use of renewable energy	The new Renewable Energy Directive includes an obligation for Member States to increase the share of renewable energy in the building sector and to, where appropriate, require minimum levels of renewable energy to be set for new buildings and buildings undergoing major renovation. The EPBD recast proposal, COM(2008)780, abolishes thresholds for new buildings for which minimum energy performance requirements will have to be met and reduces the threshold from 1000m² to 50m² for existing buildings.
3) study how to improve the performance of household biomass boilers and reduce pollution, with a view to setting requirements in the framework of the eco-design directive	A tendered study on biomass small-scale solid fuel (including biomass) boilers was launched in May 2007. A draft implementing measure will be developed depending on the outcome of this study. The study can be followed at: http://www.ecosolidfuel.org/
4) encourage district heating scheme owners to modernise them and convert them to biomass fuel	The Renewable Energy Directive creates incentives to switch from conventional fuels to renewables to meet Member States' targets. The Directive also asks Member States to give guidance on incorporating district heating and cooling in planning, designing, building and renovating industrial or residential areas. It also requires Member States to assess the necessity to build new district infrastructure for heating and cooling in their National Action Plans and where appropriate take steps with a view to developing a district heating infrastructure from biomass.
5) encourage Member States that apply a reduced VAT rate to gas and electricity and to apply such a rate to district heating too	Directive COM(2006)18 is under review and a Commission proposal to streamline VAT rates and favour reduced rates for renewables is due to be adopted in 2009.
6) pay close attention to the implementation of the Directive on electricity from renewable energy sources	A progress report is included in this Communication
7) encourage Member States to harness the potential of all cost-effective forms of biomass electricity generation	The Renewable Energy Directive allows Member States to cooperate on joint projects and statistical transfers to allow Member States to meet their targets in the most cost-effective way. The Commission produced an assessment of the effectiveness and efficiency of national support schemes (COM(2008)57).
8) encourage Member States to take into account, in their support systems, the fact that, in combined heat and power plants, biomass can provide heat and electricity at the same time	As well as the actions identified in point 4, the co-generation Directive 2004/8/EC requires Member States to analyse the national potential for the application of high-efficiency cogeneration, including for renewables.

Transport biofuels 9) bring forward a report in 2006 in view of a possible revision of the biofuels Directive, including an impact assessment	The Renewable Energy Directive includes the transport sector and set a minimum target of a 10% share of renewables in transport. Directive 2003/30/EC will be repealed and the new Directive includes sustainability criteria for biofuels and the promotion of electric-cars from renewables as well as second-generation biofuels. An Impact Assessment was carried out (SEC(2008)85).
10) encourage Member States to give favourable treatment to second-generation biofuels in biofuels obligations	The Renewable Energy Directive gives a bonus to second generation Biofuels: they will count twice towards any national biofuels obligations.
11) bring forward a legislative proposal promoting the public procurement of clean and efficient vehicles, including those using high blends of biofuels	A directive on public procurement of clean and efficient vehicles was agreed at first reading in October 2008, based on the Commission's proposal COM(2007)817 and Member States have 18 months to transpose it.
12) examine how biofuel use can count towards CO2 emission reduction targets for car fleets	The proposed Regulation for setting emission performance levels for passenger cars, based on COM(2007)856, was agreed in co-decision procedure in December 2008. It considers that the target for reducing CO2 emissions to 130g CO2/km can be achieved by new vehicle motor technology and a further reduction of up to 10g can be delivered by alternatives, such as sustainable biofuels.
13) pursue a balanced approach in ongoing free trade agreement negotiations with ethanol-producing countries/regions	In negotiating Free Trade Agreements, the Commission is undertaking trade sustainability impact assessments to ensure a balanced approach.
14) propose amendments to the "biodiesel standard" to facilitate the use of a wider range of oils, including imported oils, to produce biodiesel, and allow ethanol to replace methanol in biodiesel production	CEN (European Standardisation Committee) has a mandate to amend the standard EN 14214.
15) assess the impact of options to address the issues of limits on the content of ethanol, ether and other oxygenates in petrol; limits on the vapour content of petrol; and limits on the biodiesel content of diesel	The Fuel Quality Directive 98/70/EC was amended in co-decision procedure, taking into account these issues.
16) ask the relevant industries to explain the technical justification for practices that act as barriers to the introduction of biofuels	The Commission carried out a study of a wider scope, looking at benchmarking and permitting procedures and barriers for various bio-energy plants: co-firing, biofuels, biogas and combustion. The results of the study are available at: http://ec.europa.eu/energy/renewables/studies/index_en.htm
17) support developing countries by helping them to produce biofuels and by maintaining market access conditions that are no less favourable than those provided by the trade agreements currently in force	The Thematic Programme for Environment and Sustainable Management of Natural Resources including Energy support sustainable energy projects in developing countries: http://ec.europa.eu/europeaid/where/worldwide/environment/index_en.htm The dedicated EU-ACP Energy facility finances similar projects: http://ec.europa.eu/europeaid/where/acp/regional-

	cooperation/energy/cfp/cfp_en.htm The Global Energy Efficiency and Renewable Energy Fund (GEEREF) also allocated specific funds for projects in developing countries
18) bring forward a communication dealing specifically with biofuels early in 2006	A biofuels strategy was adopted by the Commission in 2006 (COM(2006)34) and since then biofuels strategies were further developed through the Renewable Energy Road Map (COM(2006)848) and the Renewable Energy Directive (COM(2008)19).
19) Take steps to improve understanding of the costs and environmental impacts of all transport fuels, including conventional biofuels	The costs and environmental impacts of biofuels are monitored on a biannual basis through Directive 2003/30/EC and will continue to be monitored through the renewable Energy Directive
20) take steps to promote the use of ethanol in diesel blends and or engines	related TREN tender project is ongoing with CEN participation
21) look for solutions to the problem of overcompensation for biofuels under tax exemptions	The Commission services consider that the risk of overcompensation is low, and will consider the issues on a case-by-case basis
Cross-cutting issues	
22) assess the implementation of the energy crop scheme	The CAP Health Check has abolished from 2010 specific support for energy crops, as the premium has been effective only in very limited circumstances and has not been an incentive for production[73].
23) finance a campaign to inform farmers and forest holders about the properties of energy crops and the opportunities they offer	Rural development funds are used in some cases to support such measures.
24) bring forward a forestry action plan in which energy use of forest material will play an important part	The Commission adopted Communication COM(2006)302 on an EU Forest Action Plan, whose implementation is currently undergoing a mid-term review.
25) review the impact of the energy use of wood and wood residues on forest based industries	The Standing Forestry Committee has formulated an opinion which inter alia advocates Member States to develop a strategy on the mobilisation and efficient use of wood and the Commission's Communication on innovative and sustainable forest based industries (COM(2008)113) asks Member States to pay attention to the different uses of biomass when developing National Action Plans. The Renewable Energy Directive requires Member States to outline measures to be taken to develop existing biomass resources and mobilise new biomass resources for different uses.
26) consider how the waste framework legislation could be amended to facilitate the use of clean wastes as fuel	The revised waste framework directive was adopted in co-decision procedure in June 2008. A supplementary consultation was launched on bio-waste management (COM(2008)811) to consult about waste management options for bio-waste including collection (separately or with mixed waste), anaerobic digestion and composting, incineration, and land-filling.
27) review how animal by-products legislation could be amended in order to facilitate the authorisation and approval of alternative processes for the production of biogas and other biofuels	The proposed revision of Regulation (EC) No 1774/2002 on animal by-products (COM(2008)345) aims to clarify the application of Community Legislation on industrial emissions to the burning of animal by-products as a fuel. A clearer and more streamlined approval procedure could significantly contribute to a more widespread use of animal by-products as an energy source, while

	preserving the current high level of protection of public and animal health in the Community.
28) encourage the European Committee for Standardisation to speed up work on standards for the quality of biomass fuels	CEN TC 343 activities on "refuse derived fuels" are ongoing according to an EC mandate. Another tender TC 335 ongoing on solid biomass fuel standards.
29) explore how to develop a European spot market in pellets and chips	Projects have been carried out under the Intelligent Energy Europe programme (e.g. EuBioNet II, BioXChange). Information can be found at: http://ec.europa.eu/energy/intelligent/projects/index_en.htm Standardisation related issues are covered by the 6th Framework Programme on research and technological development, e.g. BioNorm II, which is related to CEN TC 335 activities on solid biofuels. More information is available at: http://www.bionorm2.eu/
30) encourage Member States to establish national biomass action plans	Three expert meetings were held and 5 National Biomass Action Plans have been submitted to date. More information is available at: http://ec.europa.eu/energy/renewables/bioenergy/national_biomass_action_plans_en.htm
31) encourage Member States and regions to ensure that the benefits of biomass are taken into account when preparing their national strategic reference frameworks (NSRF) and operational plans (OPs) under the cohesion policy and the rural development policy	Around €8.15 billion or 2.6% of total financial resources were allocated to energy projects under the structural and cohesion funds, of which €6.34 billion were allocated to renewable energy and energy efficiency. Biomass projects make up around 22% of this total. More information at: http://ec.europa.eu/regional_policy/atlas2007/index_en.htm The Health Check of the Common Agricultural Policy identified renewable energy as one of the new challenges for agriculture. It will increase the funds available (EAFRD) for the new challenges by 3.2 billion Euros for 2010-2013. By mid-2009, Member States will have to revise their national strategy plans and their rural development programmes taking into account the new challenges. Co-financing rates are increased for measures addressing the new challenges.
30b) consider how to develop sustainability criteria for transport biofuels production and utilisation	The Renewable Energy Directive sets binding sustainability criteria to be applied to all biofuels/ bioliquids consumed in the European Community whether or not they are domestically produced or imported
Research 32) continue to encourage the development of an industry-led "Biofuel technology platform"	The biofuel technology platform was launched in June 2006 and continues to operate. More information can be found at: http://www.biofuelstp.eu/
33) consider how best to take forward research into the optimisation of agricultural and woody crops for energy purposes and biomass to energy conversion processes, give a high priority to research into the "bio-refinery" concept and to research into second-generation biofuels.	Ongoing, the work programmes under the Seventh Framework Programme are updated annually. For more information see: http://cordis.europa.eu/fp7/home_en.html

ANNEX A: MEMBER STATES' SUPPORT SCHEMES FOR ELECTRICITY FROM RENEWABLE ENERGY SOURCES.

Details of national schemes, drawn from Member States' reports.

Austria	**Price Regulation (feed-in tariff):** since 2003 support has been based on a standardised feed-in tariff system. In 2006 feed-in tariff support was reduced from 13 years to 10 years plus two years at a reduced rate. The feed-in rates were also reduced. The feed-in tariffs for 2007 were: • Wind: 7.55€ct/kWh for 10 years plus 2 years at a reduced rate • Solid Biomass: 11.10-15.65€ct/kWh for 10 years plus 2 years at a reduced rate • Liquid Biomass: 6-12.50€ct/kWh for 10 years plus 2 years at a reduced rate • Biogas: minus 30% for 10 years plus 2 years at a reduced rate • Landfill gas: 4.05-5.95€ct/kWh for 10 years plus 2 years at a reduced rate • Geothermal: 7.30€ct/kWh for 10 years plus 2 years at a reduced rate • PV: 30-46€ct/kWh for 10 years plus 2 years at a reduced rate • Small hydro tariffs due to be set by 31 December 2007. Tariffs for plants constructed by 31 December 2007 (dependent on output) were between 3.15-6.25€ct/kWh. **Subsidies:** there is €4bn available to support new green electricity generating systems. €1bn of this was added in 2006, of this 30% is for wind, 30% is for solid biomass, 30% is for biogas and 10% is for all other green electricity generating stations excluding hydropower. Up to €50m is available for medium-scale hydropower (10-20MW).
Belgium	**L'Etat fédéral** (competency for offshore electricity from renewable energy sources). ***Green certificate system*** with guaranteed minimum prices according to the electricity from renewable energy sources type. There is an obligation to buy all electricity from renewable energy sources. Theoretically, green certificates can be sold in other Belgian Regions but the Federal Estate claims that the Regions do not recognise the certificates at the moment. The minimum prices are guaranteed for 10 years (20 for offshore wind). The tariffs are: • offshore wind ≤216 MW €107/MWh or €90/MWh for further capacity; • onshore wind €50MWh; • hydro power €50MWh; • Solar power €150MWh; and • other €20MWh. ***Income tax reduction:*** people who invest in energy efficiency measures (notably solar thermal and solar PV) are entitled to a 40% income tax reduction (up to €3,380). Businesses can also benefit from an income tax reduction if they produce electricity from renewable energy sources. ***Photovoltaics on public buildings:*** the aim is to have 1km² of PV. €2m funding is available. ***Wind power zone*** (200km²) created in 2004 in the North Sea (2000MW potential). In 2008 there will be new legislation to limit the additional costs due to distance for wind parks. The State already provides up to €25m for under-sea cable for each project ≥216MW and guarantees the security of investment if an authority stops a development. **Wallonia** ***Green certificate scheme*** with a quota obligation. Green certificates are issued for each MW of electricity from renewable energy sources. The quotas are: 7% in 2007; 8% in 2008; 9% in 2009; 10% in 2010; 11% in 2011 and 12% in 2012. If quotas are not met there is a fine of €100 per certificate (however under certain conditions quotas can be reduced). The minimum guaranteed price for a green certificate is €65 this is guaranteed for 15 years. (The 2006 median market price was €91.58). Additional green certificates over and above the quota are sold at the market price. Green certificates granted

	outside Wallonia are valid following mutual recognition. There will be a review of 2010-2012 quotas by 1 September 2009. Quotas for 2013 onwards will be set after 1 January 2010. ***Private sector subsidies:*** up to 40% of investment (minimum is €25,000) for the production of energy from renewable sources. ***Public sector subsidies:*** amounting to 30% of TVAC with a possible 10% bonus if the amount of electricity from renewable energy sources can be calculated on site. **Flanders** ***Green certificates*** issued for each MW of electricity from renewable energy sources. There is an annual quota which rises annually to 6% electricity from renewable energy sources in 2010. There is a fine of €125 per MW if the quota is not met. (25% of electricity from plants 20-100GWh and 50% of electricity from plants over 100GWh is exempt from the scheme). There is a minimum price guarantee for 10 years at €80 per Green Certificate for wind, biomass and biogas; and €450 for 20 years for solar. ***Grants:*** are available for electricity from renewable energy sources projects, calculated on the basis of incremental costs of a traditional installation. Subsidies vary depending on the technology and higher subsidies are available for small to medium sized businesses. **Brussels** ***Green certificates*** are issued for each MW of electricity from renewable energy sources for 10 years of a plant's operation. PV gets 4 certificates per MW for the first 20m² installed, 3 certificates for the next 40m² and 2 for the rest of the capacity. Green certificates for bio-methanisation are calculated on the basis of the organic waste collected in the perimeter of the plant (the number of certificates is limited to 2 per MW). In 2007 the market price was around €92 for a green certificate and Elia (the system operator) guarantees €150/MWh (Elia's price for electricity from renewable energy sources varies according to the market). Green certificates can be freely traded and are valid for 5 years from the date of issue. The quotas for electricity from renewable energy sources are: 2.5% in 2008; 2.5% in 2009; 2.75% in 2010; 3% in 2011 and 3.25% in 2012. There is a fine of €100 per MW if the quota is not met. ***Subsidies:*** for PV a subsidy of up to €3,000 per house is available (third sector organisations get 40%). Third sector and business electricity from renewable energy sources operators are also entitled to a 40% subsidy for wind or biomass projects.
Bulgaria	**Price regulation (preferential prices):** there is an obligation to purchase electricity from renewable energy sources at preferential prices (except for hydropower over 10MW). These prices apply to all electricity from renewable energy sources generating capacity put into operation by 31 December 2010 and are set annually. The March 2008 prices were: • hydro <10MW 97.12 BGN/MWh; • wind 139.96-185.96 BGN/MWh; • PV 718-782 BGN/MWh; • Biomass <5MW 164-215 BGN/MWh. A market mechanism to promote electricity from renewable energy sources and thermal energy will be submitted for approval to the Council of Ministers no later than 31 December 2011. **Loans:** public-private-partnerships partly funded by the Kozloduy International Fund (KIF), the European Bank for Research and Development (EBRD) and the European Investment Bank (EIB). A KIF loan of €25.2m generates an EBRD loan of €105m. Electricity from renewable energy sources projects are entitled to up to 20% of their costs. The Enterprise for Management of Environmental Protection Activities (under the Ministry of Environment and Water) also provides interest-free loans of up to 70% for small hydropower plants.
Cyprus	**Price regulation (fixed price):** the Electricity Authority of Cyprus is obliged to buy electricity from renewable energy sources at 3.7 CYP/kWh (6.29€ct/kWh). A new price is due to be set at the beginning of 2008. **Subsidies:** a fund for electricity from renewable energy sources projects is provided from a levy of 0.0013 CYP/kWh (0.0074€ct) on electricity consumption.

	• For wind projects up to 30kW businesses get up to 40% of their costs up to €41,006.43 and CY citizens get 55% up to €51,258 per unit. The electricity is then sold at 6.32 €ct/kWh. • For windmills businesses get 40% up to €17,086 and CY citizens get 55% up to €25,629 per unit. • For installation/replacement of solar thermal water heating businesses get 30% up to €17,086 and CY citizens get 45% up to €25,629. • For installation/replacement of solar thermal space heating and cooling systems businesses get 40% up to €85,430 and CY citizens get 55% up to €117,466 per unit. • New/replacement domestic solar systems get up to €170.86 for thermosyphonic systems and up to €341.73 for forced circulation. • For space heating using biomass CY citizens get 55% up to €18,795. For PV under 20kW there are two options. Option A businesses get 40% up to €47,840.84 and CY citizens and not-for-profit organisations get 55% up to €64,926.85. Electricity would then be sold at 14.18€ct/kWh (Subsidy of 20.5€ct/kWh minus 6.32€ct is 14.18€ct/kWh). Option B: businesses would sell electricity at 27.17€ct and households and other entities would sell it at 31.95€ct/kWh. • For desalination using renewable energy: small to medium sized businesses get 30% in regional aid plus de minimis aid which in total should not exceed 40% of total costs of €170,860. • For hydro small to medium sized businesses get 30% in regional aid plus de minimis aid which in total should not exceed 40% of total costs of €102,516. Electricity is sold at 6.32€ct/kWh. • For Geothermal heat pumps businesses can get 30% of costs up to €170,860. Households and non-profit organisations can get up to €15,377. • For biomass 10-40% of costs can be covered depending on the size of the installation and the size of the enterprise up to €683,441. Electricity is then sold at 6.32€ct. Additionally grants and subsidies of between €123-152m are expected by 2010 for renewable energy and energy conservation. In 2007 the cap for photovoltaic power was lifted from 5kW to 20kW. [It is unclear whether there are caps for other electricity from renewable energy sources technologies].
Czech Republic	Guaranteed prices for electricity from renewable energy sources over 15 years. Electricity from renewable energy sources producers can choose between minimum feed-in tariffs or green bonuses (surcharges on the market price for electricity). The tariffs for new plants decrease by 5% each year. In 2006: • small scale hydro got 1690-2398 CZK/MWh from the feed-in tariff or 640-1340 CZK/MWh from green bonuses. • Wind got 2460-3020 from the feed-in tariff or 1950-2690 CZK/MWh from green bonuses. • Biomass got 2340-3375 CZK/MWh from the feed-in tariff and 1220-2255 CZK/MWh from green bonuses. • Biogas got 2670-3040 CZK/MWh from the feed-in tariff or 1550-1920 CZK/MWh from green bonuses. • Geothermal got 4500 CZK/MWh from the feed-in tariff or 3510 CZK/MWh from green bonuses. • Solar got 6410-13460 from the feed-in tariff or 1275-5700 from the green bonus. ***Subsidies:*** 30% of capital costs up to CZK 2.8m. (For non-profit organisations and public bodies up to 90% is available). There are also two EU Structural Aid programmes: Industry and Enterprise Operational

	Programme gave up to 46% of capital costs up to CZK 30m; the Infrastructure Operational Programme from the European Regional Development Fund provides up to 75% but no more than CZK 10m. A project could also be funded by a State Environmental Fund taking support up to 90% of costs.
Denmark	**Subsidies:** for onshore wind have increased and there will be several new tenders for 2x200MW offshore wind farms. There was also an increase in the subsidy for biomass and biogas. The self-sufficiency rule for waste incineration at power stations has been repealed.
Estonia	**Fixed price and guaranteed purchase:** from 2007 network operators were obliged to buy all electricity from renewable energy sources at a fixed price of 1.15 EEK/kWh. (Therefore the mandatory purchase price rose by 42% and network operators were no longer just obliged to purchase electricity from renewable energy sources to cover network losses). In addition to the purchase obligation electricity from renewable energy sources producers can also receive aid of 0.84 EEK/kWh for electricity sent to the grid and sold. The duration of the aid scheme was also extended to 12 years (it had previously been 7-12 years but only up until 2015). There is a restriction on wind energy from 2009: only the first 400GWh in a calendar year can receive aid and only the first 200GWh is entitled to the purchase obligation. All further electricity must be sold on the open market.
Germany	**Price regulation (fixed prices):** higher than market prices for electricity from renewable energy sources which differ depending on the type of electricity from renewable energy sources. For biomass, the fee structure is based on the plant's size and there are various bonus payments for using renewable sources or timber remains from forestry; new technology; or operating on a Combined-Heat and Power basis. There are incentives for modernising hydro plants over 5MW. The next EEG Review (Erneuerbare Energie Gesetz) will reassess the tariffs for electricity from renewable energy sources based on the current state of development and profitability. It is also expected to include new incentives to make hydro more popular. This is due in December 2007 and will provide the basis for a further review of the Act in 2008. The Government has given initial indications of suitable sites for wind farms. There is a pilot geothermal plant which has been in operation since 2004. Three more plants are expected to come on line before the end of 2007.
Greece	**Price regulation (feed-in tariff):** with a 10 year guarantee which can be extended by up to 10 years upon a producer's unilateral declaration to the responsible Operator. The prices for 2007 were: • Offshore wind got 92.82 €MWh • PV got 452.82 €MWh if interconnected and 502.82 €MWh for non-connected islands • Solar (other than PV) ≤5MW got 252.82 €MWh if interconnected and 272.82 €MWh if on a non-connected island. • Solar (other than PV) ≥5MW got 232.82 €MWh if connected and 252.82 €MWh if on a non-connected island. • Onshore wind, hydro up to 15MW, geothermal, biomass, biogas and others got 75.82 €MWh for interconnected systems and 87.42€MWh for non-interconnected islands. **Subsidy for electricity from renewable energy sources:** public aid is provided for capital electricity from renewable energy sources investments of 20, 30 and 40% depending on which zone of Greece the electricity from renewable energy sources system is in. The grant is increased by 10% for medium businesses and 20% for small businesses. For investments in solar and wind the grant amounts to 40% of costs (including any mark-up).

	2nd (2002) and 3rd (2004) Community Support Frameworks funding for electricity from renewable energy sources totalled respectively €196.40m with a total public expenditure of €79.9m and €735.79m with a public expenditure of €252.70m. **Subsidy for PV:** currently being developed based on public aid from domestic and Community resources under the National Strategic Reference Framework.
Spain	**Premiums** for electricity from renewable energy sources which depend on the size of the plant and the type of electricity from renewable energy sources. The financial incentive for biomass used to produce electricity was increased. The Renewable Energies Plan 2005-2010 allocated €6.2m for solar thermal projects from 2006 onwards. From 2006-2010 there is aid for PV not connected to the grid via the Autonomous Regions and tariffs, incentives and premiums for connected PV.
Finland	**Tax benefits:** the introduction of emissions trading in 2005 prompted changes to the support schemes in Finland. Tax benefit for electricity generated from wood and wood-based fuels, waste gas from metallurgical processes and chemical reaction heat were discontinued in early 2007. (Subsidies for wind, small hydro, recycled fuels, forest processed chips and biogas was retained). **Subsidies:** for renewable energy investments in the emissions trading sector were suspended other than for innovative technology projects. Aid continues to be granted outside the emissions trading sector. Aid for wind energy investment is only available for projects using innovative technology. **Feed-in tariff:** a Bill including a feed-in tariff for biogas plants under 20MW is due to be submitted to Parliament during the Spring 2008 session. The scheme will include field biomass, slaughterhouse waste, various manures or municipal waste as fuel. The use of new support schemes or a possible extension of existing ones (i.e. feed-in tariff) will be reconsidered if the current measures fail to promote electricity from renewable energy sources sufficiently. Finland is preparing a Climate and Energy Strategy which should be ready by 2008.
France	**Price regulation (tarif d'achat)** obligation to buy electricity from renewable energy sources. There is a guaranteed price (higher than the market price) which electricity from renewable energy sources producers are entitled to. This price is guaranteed for 15-20 years depending on the type of electricity from renewable energy sources. In 2006 and 2007 the prices were adjusted to reflect the costs of investment and exploitation. Bonuses can also be granted to take account of positive effects on air quality, reducing CO2 and the development of future technologies. Only wind farms which are in identified zones are entitled to support. These zones are defined on the basis of the community concerned, so not just the potential for wind power but also taking account of the environment, historical monuments and protected sites. The tariffs are: • Hydro for 20 years at 6.07ct€/kWh plus a bonus of 0.5-2.5 ct€/kWh for small installations and a bonus of 0-1.68 ct€/kWh in winter. • Biogas for 15 years at 7.5-9 ct€/kWh with a bonus for energy efficiency at 0-3 ct€/kWh and a 2 ct€/kWh bonus for methanisation. • Onshore wind for 15 years: 8.2 ct€/kWh for 10 years and 2.8-8.2 ct€/kWh for 5 years, according to the site. • Offshore wind for 20 years: 13 ct€/kWh for 10 years and between 3-13 ct€/kWh for the next 10 years, according to the site. • PV for 20 years. In Metropolitan France get 30 ct€/kWh plus a bonus of 25 ct€/kWh for grid integration. In the overseas departments it is 40 ct€/kWh plus a bonus of 15 ct€/kWh for grid integration. • Geothermal for 15 years. In Metropolitan France it is 12 ct€/kWh plus an energy efficiency bonus of 0-3 ct€/kWh. In the overseas departments it is 10 ct€/kWh plus an energy efficiency bonus of 0-3 ct€/kWh. **Invitations to tender (appels d'offres)** for wind, biomass and biogas, producers benefit from a fixed price agreed through the contract.

	Crédit d'impôt a reduction of up to 40% of tax on equipment used for electricity from renewable energy sources development.
Hungary	**Price regulation:** there are fixed prices for electricity from renewable energy sources dependent on the type of technology and the season (electricity from renewable energy sources affected by the weather has a fixed price but electricity from renewable energy sources not affected by the weather has a seasonal price to keep its average price at the same amount). The prices are amended annually according to the rate of inflation. Mandatory acceptance is valid for the return of a given investment. The highest starting value for a subsidised price is 26.46 HUF/kWh as of 1 January 2008. **Investment subsidies:** the Energy Conservation programme is a competitive tender system for energy conservation including electricity from renewable energy sources. In 2007 2.6bn HUF was granted as subsidies and 16bn HUF was loaned on favourable terms. The Environmental and Infrastructure Operative programme and EU Structural Funds provided 3.35bn HUF of subsidies for electricity from renewable energy sources in 2004-6. More funding is available for 2007-2013. The New Rural Development Strategic Plan supports biomass and biogas. **Loans:** the Energy Conservation Fund grants loans with favourable interest.
Ireland	Ireland is in the process of replacing its quota based tendering programme with a feed-in tariff programme. (Feed-in tariff was approved by the European Commission in September 2007).
Italy	The measures being taken to achieve the objectives have undergone various amendments, all with the aim of strengthening policy in favour of renewables.
Lithuania	**Purchase obligation and feed-in tariffs** for electricity from renewable energy sources approximately 3 times higher than the average electricity sale price from the Ignalina Nuclear Power Plant. The prices are guaranteed until 2020 and are adjusted according to inflation. In 2007 they were: • hydro <10MW 5.79 ct€/kWh; • wind 6.37 ct€/kWh; • biomass 5.79 ct€/kWh. On 1 January the feed-in tariffs will be revised and augmented. For plants commissioned before 1 January 2008 that use Biofuels to generate electricity will receive 6.37ct€/kWh and those commissioned after 1 January 2008 will receive 6.95ct€/kWh. (As of 1 January the purchase price of electricity is 5.79ct€/kWh). **Lithuania Environmental Investment Fund** (funded by 30% of an environmental pollution tax) provides soft loans for projects to reduce the impact of economic activities on the environment. The maximum loan per project is 1.5m LTL over a maximum of 5 years. Subsidies must not exceed 350,000 LTL (per recipient, per 3 years) to a maximum of 70% of the costs. **Ministry of Agriculture and Rural Development Programme** for 2007-2013 promotes wind farms under 250kWh on farmland provided the electricity is used in agricultural processes. Up to 40% of costs are available (or 50% for young farmers who meet prescribed criteria).
Latvia	**Price regulation:** compulsory purchase for hydro, wind, biogas and biomass. There are annual quotas for the compulsory purchase of electricity from renewable energy sources for the 2007-2010 period. The compulsory purchase of electricity from renewable energy sources from biomass plants up to 4MW; and biogas and hydro power plants up to 5MW; and wind farms under 0.25MW price formulae are applied. Wind farms over 0.25MW use a tendering process in which the lowest-price principle applies. (A call for tender was issued on 5 March 2008 and closes on 30 December 2008 the starting price has been set at LVL 70.2804/MWh). For biomass plants over 4MW the selling price is set by the Public Utilities Commission. The price of electricity from renewable energy sources which operators do not have the right to sell within a compulsory purchase framework is determined by agreement between the operator and any electricity market.
Luxembourg	**Feed-in Tariff and a purchase obligation** for wind, hydro, biomass and biogas. There is an aid regime for LU citizens who produce electricity from renewable energy sources.
Malta	**Financial support mechanism** capital grants of 25% of the purchase price for micro-wind turbines up to 3.7kW (maximum grant €233); 20% grant for solar PV installations between 1-3.7kWp (maximum grant €1,166 with an additional €582 for every additional kWp (±5%)

	above 1kWp and the cost of installing the metre to operate the plant has been waived). **Net metering** for electricity from renewable energy sources electricity with a spill tariff of 7ct€/kWh for any excess electricity fed into the grid. Malta published a draft renewable energy policy for public consultation in August 2006 (an energy policy consultation was also launched in 2006). The Renewable Energy policy will: set goals; put appropriate support schemes and regulatory measures in place; and encourage investment and public participation. A call for expressions of interest for a deep offshore wind farm (75-100MW) was issued in 2006 on a public, private partnership basis. It is unlikely that such a project would be built before 2010.
Netherlands	**Decree on promoting sustainable energy production:** subsidy provision for electricity from renewable energy sources. Each year the Minister for Economic Affairs sets a maximum budget for the subsidies. Guaranteed prices for 10 years although this time period can be shortened or lengthened. The subsidy covers the actual unprofitable tip of electricity from renewable energy sources. **Energy research subsidy:** the budget is set annually and is allocated via a tender process. **Energy Investment Allowance:** a tax incentive scheme allowing electricity from renewable energy sources projects to deduct a certain percentage of the purchase value from the taxable profits. **Green Investment:** a electricity from renewable energy sources investor can obtain finance from a fund on favourable terms (1-2% below project financing).
Poland	**Green certificates obligation** energy companies selling electricity are required to present a certain number of green certificates or pay substitution fees. There is an obligation to buy electricity from renewable energy sources at the average market price. **Grants and preferential loans** are available from the National Environment Protection and Water Management Fund and provincial funds for electricity from renewable energy sources investments. **The Infrastructure and Environment Operational Fund** supports construction or capacity expansion of wind, hydro up to 10MW, biogas and biomass projects and heat generating stations using solar or geothermal energy.
Portugal	**Tariffs for electricity from renewable energy sources**: • Wind 74-75€/MWh; • hydro 75-77€/MWh; • PV 310- 317€/MWh; • solar-thermal 267-273€/MWh; • PV microgeneration 355-470€/MWh; • biomass 102-109€/MWh; • biogas 102-117€/MWh; • municipal waste incineration 53-54€/MWh; • wave (demonstration to commercial) 76-260€/MWh. In 2005 a public tender was issued for 1,800MW to be supplied from wind farms. In 2006 a public tender was issued for 100MW to be supplied from 15 forest biomass plants. Contracts for 922MW of new hydro were issued at a cost of €1bn. A licence was awarded for a 76GWh PV plant. Operation commenced on the world's first wave-power plant (4MW).
Romania	**Obligatory quota system and a green certificate trading scheme:** a green certificate is provided for each MW of electricity from renewable energy sources and can be traded in a competitive market (prices must fall between €24-42 up to 2012). Annual obligatory quotas for green certificates have been established up until 2012. Wind, solar, geothermal, biomass, wave and hydro ≤10MW are eligible. The quotas for electricity from renewable energy sources are: 0.7% in 2005; 2.22% in2006; 3.74% in 2007; 5.26% in 2008; 6.78% in 2009; 8.3% in 2010-2012. If a supplier acquires more GCs than necessary to meet the quota they can sell them to another supplier (this is at the price the seller acquired them at). In 2007 the average sale price of a GC on the market was €42. [This is the highest price that they can be sold at].

Sweden	**Quota system** electricity certificate scheme extended until 2030. Market introduction aid for wind power. Ares of national interest for wind power have been designated. Aid for municipal wind power planning. Four national wind power coordinators have been nominated. New planning targets for wind up to 2020 are being considered.
Slovenia	**Price regulation:** electricity from renewable energy sources producers can choose between a guaranteed price (according to a uniform annual price), independent sale on the market, or a uniform annual premium (a single or dual tariff settlement can also be chosen). The tariffs (not including 20% VAT) are: • hydro annual price 0.05938-0.06155 €/kWh or annual premium of 0.02182-0.02399€/kWh; • biomass annual price 0.09118-0.09410€/kWh or annual premium 0.05362-0.05654€/kWh; • wind annual price 0.05863-0.06072€/kWh or annual premium 0.02107-0.02316€/kWh; • geothermal annual price 0.05863 or annual premium 0.02107; • solar annual price 0.37419 or annual premium 0.33663; other electricity from renewable energy sources annual price 0.12089 or annual premium 0.08333.
Slovak Republic	**Fixed purchase prices** for up to 12 years. Network operators must preferentially purchase electricity from renewable energy sources to cover their losses. The electricity from renewable energy sources prices from April 2008 are: • hydro 2000-8410 SKK/MWh; • solar 8410 SKK/MWh; • wind 2000-2940 SKK/MWh; • geothermal 3680 SKK/MWh; • biomass 2190-3600 SKK/MWh; and • biogas 2630-4310 SKK/MWh. If a electricity from renewable energy sources plant constructed after 1 January 2005 received state or EU aid the tariffs reduce as follows: • 30% aid leads to a 4% reduction; • 40% to an 8%; • 50% to a 12%; and • above 50% to a 16% reduction.
United Kingdom	**Renewables Obligation** on all electricity suppliers in GB to supply a specific proportion of electricity from electricity from renewable energy sources or to pay a penalty buy-out price. The quota is 7.9% in 2007/08 augmenting in steps to 15.4% by 2015 (it will remain at that level until 2027). Certificates are issued for each MW of electricity from renewable energy sources produced. Banding of the Renewables Obligation will be introduced to bring forward technologies currently further from commercial deployment such as offshore wind, marine and tidal and Advanced Conversion Technologies. **Exemption from Climate Change Levy** electricity from renewable energy sources producers do not have to pay. **Capital grants** Some support is available to small hydro under the Low Carbon Buildings Programme. £600m over 10 years will be provided by BP, Caterpillar, EDF, E.ON, Rolls Royce, Shell and the UK Government to the Energy Technologies Institute for wave and tidal power. The Research Council Energy Programme's budget is expected to rise to over £70m p.a. by 2007-2009. The UK is carrying out a feasibility study for a tidal power development in the Severn Estuary which could provide up to 5% of the UK's electricity.

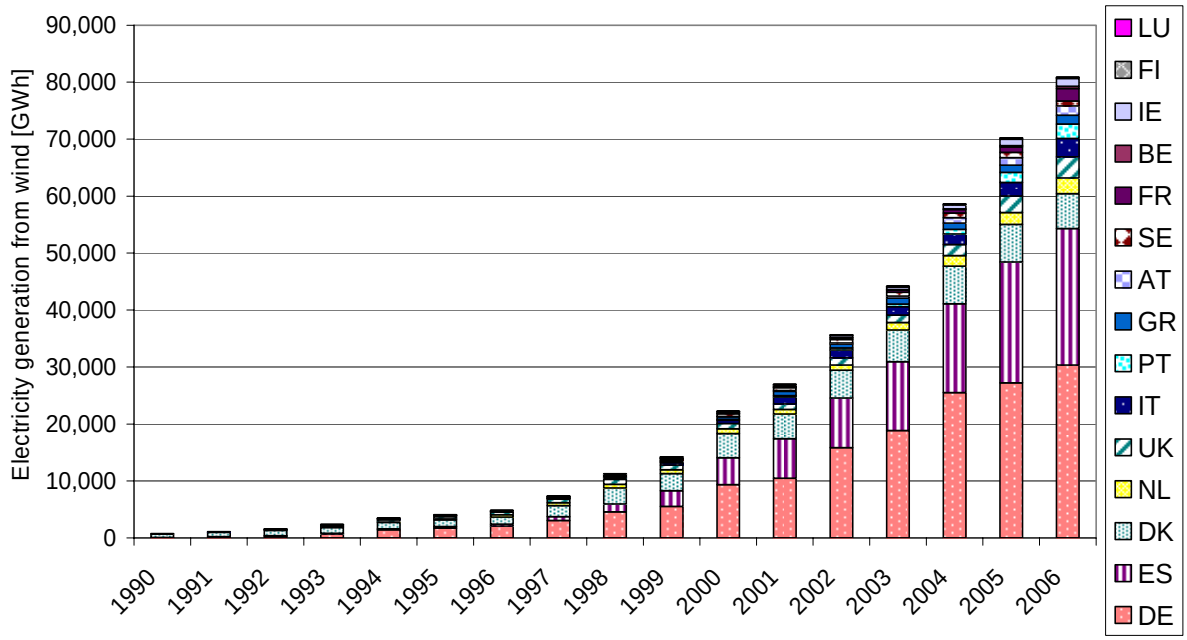
Source: Member States' 2007 Reports

ANNEX B: REVIEW OF THE PROGRESS IN DIFFERENT RENEWABLE ELECTRICITY TECHNOLOGIES

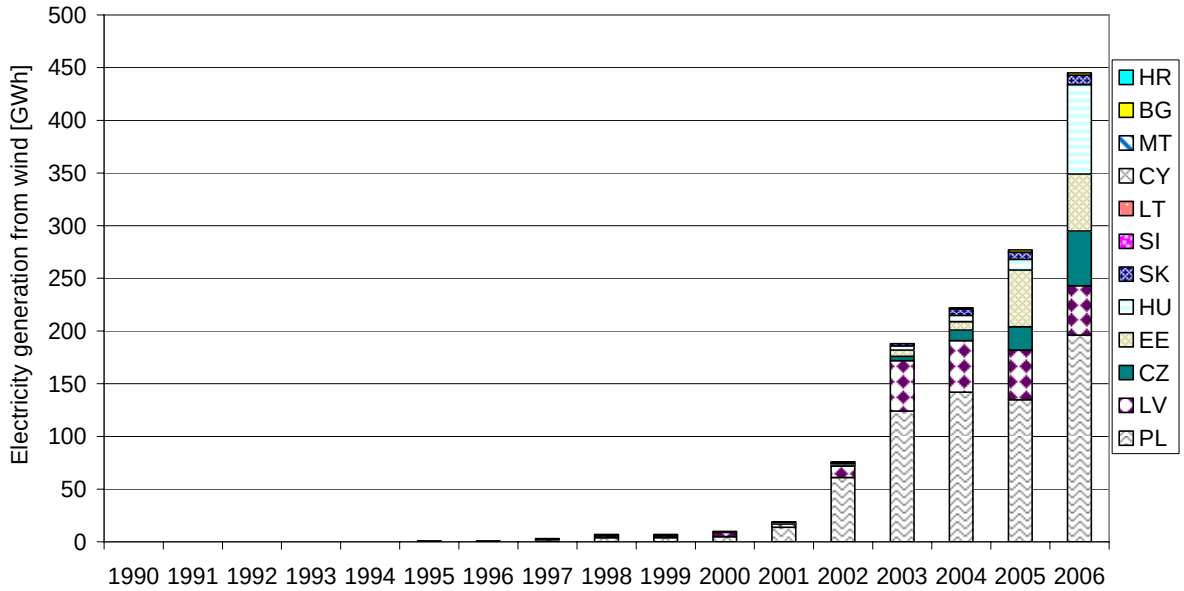
This data is drawn from Member States' reports, with graphs from Eurostat/Fraunhofer ISI "*Electricity from renewable energy sources 2006 breakdown of normalised renewable electricity in 2006*".

Wind power

Electricity generation from wind in the EU-15 Member States from 1990 to 2006.



Electricity generation from wind in the EU-12 Member States from 1990 to 2006.



At the end of 2006 Germany was the world leader in wind power with 18,685 wind turbines operating at a combined capacity of 20,622 MW producing 30,500 GWh of electricity, equal to 5% of Germany's total electricity consumption.[77] In 2006 wind power in Germany accounted for 41.3% of total electricity from renewable sources. Wind power development will continue in Germany with an increased focus on offshore wind.

In 2006, nearly two thirds (61%) of Denmark's electricity from renewable energy sources came from wind power (6,108 GWh). This accounts for 16.8% of Denmark's total energy. It should be noted that 2006 was a poor year for wind in Denmark. In 2005 6,613.8 GWh were produced which accounted for 62% of electricity from renewable energy sources or 17.5% of total electricity consumption. Subsidies for onshore wind farms were increased in February 2008. 1300 MW of new wind farms capacity is expected by 2012.

Other Member States which have significantly developed wind power generation over the past few years include:

- Spain with a wind-based growth in 2006 of 18% (1820 MW new capacity); and
- the Netherlands who have already achieved their 2001 goal to build 1500 MW of wind power by 2010; and is now aiming to install 4000 MW by 2011.

And the following Member States have significant plans for new wind capacity:

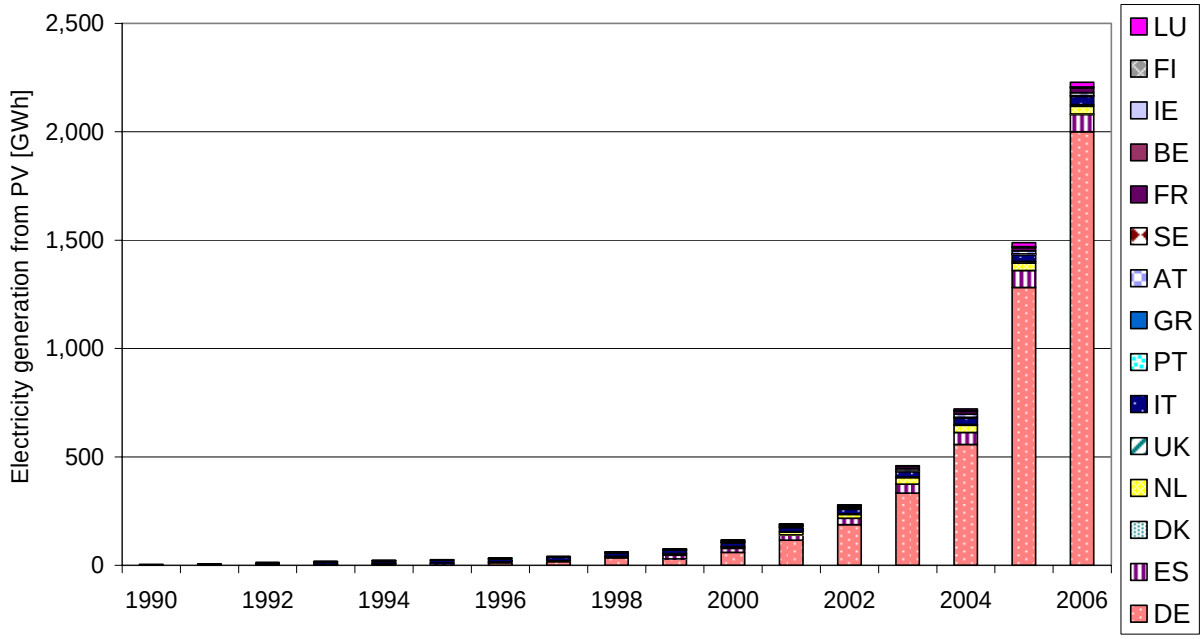
- Belgium has identified a 200km2 zone for offshore wind farm which could potentially provide 2,000 MW.
- Construction has started on Europe's largest onshore wind farm (322 MW) in Scotland. Construction of 450 MW of offshore is also underway. A further 2.5GW has been consented, including the world's largest offshore wind farm (1GW).
- Luxembourg envisages increasing its wind power fifteen-fold to meet its 2010 target of 5.7% electricity from renewable energy sources. (There were 58 GWh in 2006 which accounted for 21% of electricity from renewable energy sources and 0.7% of total electricity consumption).

The following Member States have put limits on the amount of electricity produced from wind power:

- Estonia will have a limit on wind power from 2009. Aid will only be available for the first 400 GWh per annum and the purchase obligation will only apply to the first 200 GWh. Electricity produced above these limits will be sold at market price. This is because there are no power stations which can be rapidly regulated in Estonia. In order to cover peak loads and extend the use of wind power.
- Hungary has a limit of 330 MW for wind power due to problems in regulating the electricity system.
- Wind power generation almost doubled in Czech Republic between 2005 and 2006 to 49.4 GWh (in 2006 there was 43.5 MW of installed capacity). However, the Czech Republic views that there should be no more than 600-700 MW installed wind power capacity as it increases the need for backup sources and the large-scale constructions create bottlenecks and congest lines. Therefore, rising installed capacity will be accompanied by a reduction in financial support.

[77] In the first half of 2007 there were 19,024 turbines with a total capacity of 21,283 MW

Solar Photovoltaic and Thermal electric



Electricity generation from PV in the EU-15 Member States from 1990 to 2006

Germany has the largest PV market in the world. At the end of 2006 Germany had the most installed PV (2,831 MW or 2,000 GWh) with a fourfold production increase between 2004 and 2006.

As of 2006, Spain has the second most installed capacity within the EU-27 with 144 MW. Spain's Renewable Energies Plan (2005-2010) aims to install 363 MW of solarvoltaic energy (10 times that of December 2004) in order to reach a target of 400 MW by 2010. Between 2006-2010 investment aid is available for PV isolated from the grid and operating aid is available for PV connected to the grid.

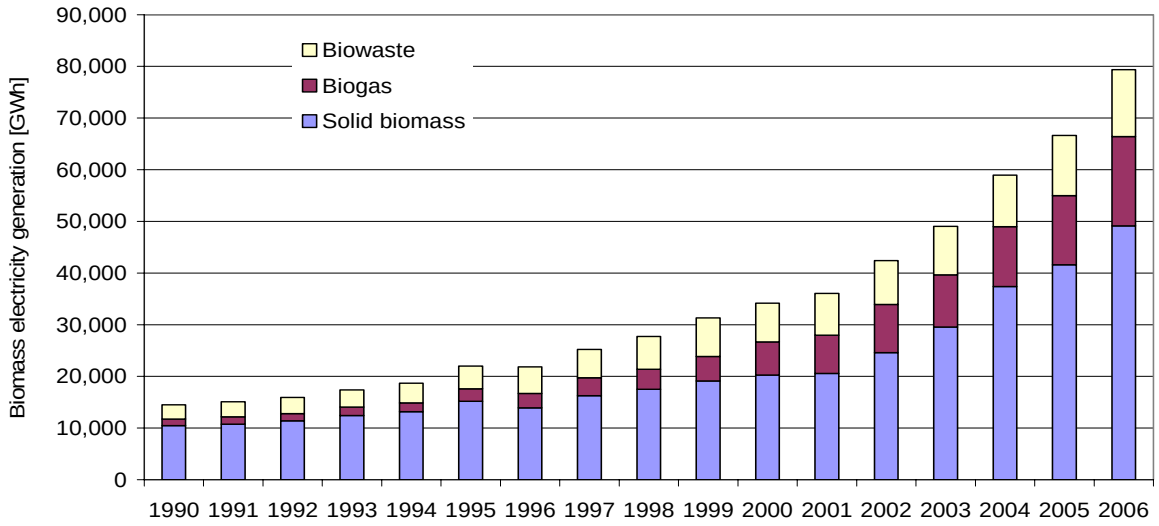
The Portuguese Government has granted a licence for a 76 GWh per annum PV power plant which will be the largest in Europe.

Luxembourg aims to have 80 GWh of PV by 2010. Due to financial support scheme there was a boom between 2002 and 2004 from 1.6 MW to 23.5 MW. (In 2006 there were 23.7 MW).

Greece expected to have 1.3 MW of registered Photovoltaic capacity by early 2008. However, there are many non-registered PV systems as they are exempt from the licensing obligation. On the basis of electricity sales Greece estimates that the total installed capacity of PV systems by early 2008 would be 5 MW.

Biomass

Electricity generation from solid biomass, biogas and municipal solid waste in the EU-27 Member States from 1990 to 2006



In 2006, Germany produced the most electricity from renewable energy sources from biomass of the EU-27 with 17,900 GWh providing 3.3% of total electricity consumption (27% of Germany's total electricity from renewable energy sources).

Other Member States which have significantly developed biomass generation over the past few years include:

- Sweden who's energy certification scheme has been extremely effective in increasing production of existing biomass-fuelled plants (3,440 GWh increase) and has stimulated the construction of new plants (721 GWh increase) between May 2003 and Sept 2007.
- The Flanders region of Belgium where 55% (1,638 GWh) of electricity from renewable energy sources came from biomass in 2007.

And the following Member States have significant plans for new biomass capacity:

- The UK's largest biomass plant was commissioned in 2007 (44 MW).
- To meet its 2010 target (5.7%) Luxembourg envisages increasing its biogas production 208-fold.
- In Denmark as of February 2008 increased subsidies for biomass and biogas. The self sufficiency rule for waste incineration has been repealed. A 700,000 tonne use of straw and timber is expected by 2011 equivalent to an increase in the total RE share of 1.2 percentage points.

The following Member States have had problems with increasing electricity from renewable energy sources from biomass:

- In Finland, there have been problems regarding authorisation for recycled fuel plants. Construction halted due to repeated appeals against environmental and construction permits following the entry into force of the Waste Incineration Directive. Finland intends to seek a uniform interpretation to the Directive. Further to this, in Finland the introduction of emissions trading in 2005 prompted changes to the subsidy mechanisms for electricity

from renewable energy sources. The tax benefit for wood, wood-based fuels, waste gas from metallurgical processes and chemical reaction heat were discontinued in early 2007.

- In Czech Republic biomass is the most technically exploitable renewable energy source. However, biomass forestry for energy purposes is only effective up to a range of 50km from the proposed site of use. Biomass is also limited by the area of land available on account of food security. In 2006 285 GWh was supplied to the grid from biomass (up from 210 GWh in 2005). There is also a lack of feed-in tariff stability for the use of energy crops for electricity and heat in Czech Republic.
- In Spain the expansion of biomass could not take place in 2006 as an expected Royal Decree was not published. The lack of suitable incentives has prevented biomass development over recent years due to an expectation that there will be substantial changes in remuneration for biomass projects.

Hydro

In 2006, 349,000 GWh were produced by hydropower in Austria. (The average annual generation is slightly more at 364,000 GWh). Austria noted that in the future hydro power will be significantly influenced not only by climatic changes but also by the implementation of the Water Framework Directive (2006/60/EC). The intensity of future requirements for decommissioning hydro generating stations and residual water flow may lead to a 5-15% fall in hydro power production in Austria.

In 2006, in Germany, 21,636 GWh was produced from hydro plants (98% of which are under 5MW). This accounts for 3.5% of total energy supply.

In 2007 80.5% of Bulgaria's electricity from renewable energy sources came from large hydropower (2,827.1 GWh) and 17.8% from small hydropower. Therefore only 1.7% of RES came from a source other than hydro- wind power. In the same year 84.5% of Romania's electricity from renewable energy sources came from hydro (13,467 GWh).

In Spain the increase in hydropower is behind schedule with 53MW and 54 MW increases in 2005 and 2006 respectively compared to an objective of a 127 MW increase per year.

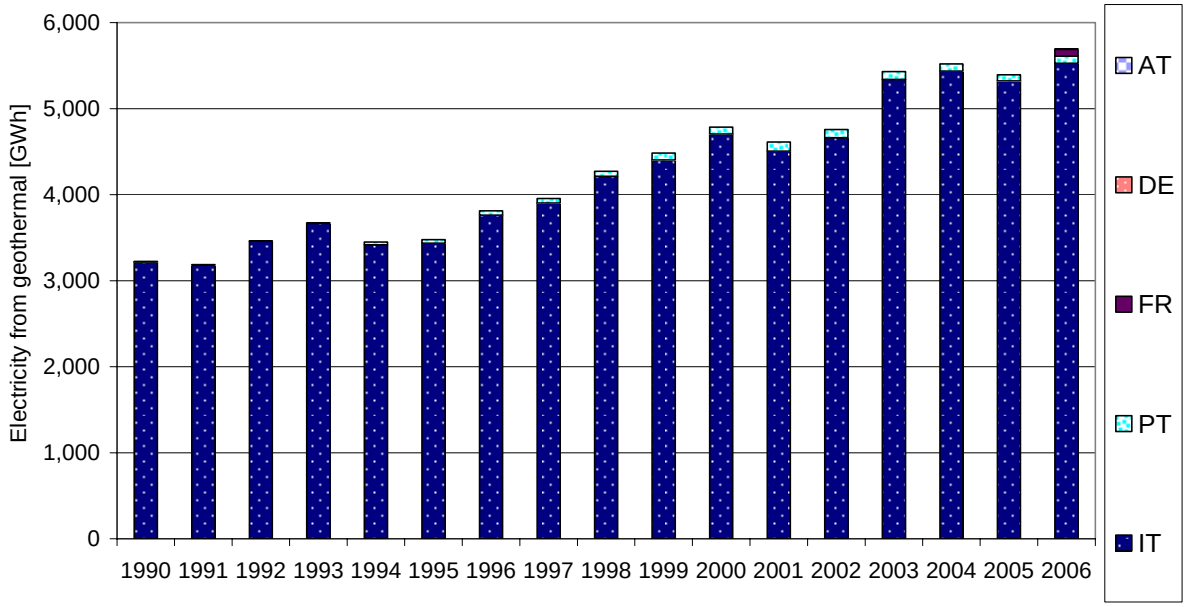
Hydro and climate conditions

When calculating Member States' electricity from renewable energy sources the European Commission uses normalised data based on the amount of hydro produced in an average year. This is important because hydro generation in can fluctuate significantly year on year. For example, in Finland year or year differences in the amount of hydropower produced can be as much as 30-50%.

Most renewable energy comes from hydroelectricity in Lithuania (79% from hydro plants over 10MW and 13% from hydro plants under 10MW). The electricity production increases in April when tidal waters are used. However, in the summer when the water levels in rivers and ponds drop the amount of energy produced is significantly reduced, and in some cases completely terminated.

Geothermal

Electricity generation from geothermal sources in the EU-15 Member States from 1990 to 2006



Italy produces the most geothermal electricity in the EU-27. In 2005 there was 711 MW installed capacity which produced 5,325 GWh. The same installed capacity produced an additional 202 GWh in 2006 (5,527 GWh) and in 2007 5,569 GWh were produced.

Wave and tidal

In Portugal the first wave-power plant with a capacity of 4 MW is operational.

A feasibility study is underway in the UK on a barrage in the river Severn which could produce up to 5% of UK electricity.

ANNEX C: BIOFUEL ENERGY SHARE

Member State	Biofuel share 2003 (%)	Biofuel share 2004 (%)	Biofuel share 2005 (%)	Biofuel share 2006 (%)	Biofuel share 2007 (%)
Austria	0.06	0.06	0.93	3.54	4.23
Belgium (*)	0.00	0.00	0.00	0.01	1.07
Bulgaria (*)				0.41	4.82
Cyprus	0.00	0.00	0.00	No data	No data
Czech Republic (*)	1.09	1.00	0.05	0.42	0.50
Denmark (*)	0.00	0.00		0.15	0.14
Estonia	0.00	0.00	0.00	0.12	0.06
Finland	0.11	0.11		0.02	No data
France	0.67	0.67	0.97	1.77	3.57
Germany	1.21	1.72	3.75	6.32	7.35
Greece (*)	0.00	0.00		0.75	1.21
Hungary (*)	0.00	0.00	0.07	0.28	0.20
Ireland	0.00	0.00	0.05	0.09	0.6
Italy	0.50	0.50	0.51	0.46	0.46
Latvia	0.22	0.07	0.33	0.22	0.14
Lithuania	0.00	0.02	0.72	1.72	4.35
Luxembourg (*)	0.00	0.02	0.02	0.026	1.46
Malta	0.02	0.10	0.52	0.582	1.08
Poland	0.49	0.30	0.48	0.92	0.68
Portugal	0.00	0.00	0.00	1.02	2.54
Romania				0.00	0.79
Slovakia	0.14	0.15		0.69	2.53
Slovenia	0.00	0.06	0.35	0.275	0.83
Spain (*)	0.35	0.38	0.44	0.53	1.11
Sweden	1.32	2.28	2.23	3.10	4.00
The Netherlands	0.03	0.01	0.02	0.29	2.00
UK	0.03[78]	0.04	0.18	0.45	0.84
EU 27	0.5(a)	0.7(a)	1.02	1.82	2.58

(a) EU 25

Source: Member States 2006 and 2007 reports, except (*) data for 2007 which is from EurObserver Biofuels Barometer

[78] 0.03% in volume terms, equating to 0.26% in energy content, assuming 100% biodiesel.

ANNEX D: MAIN PLANNED AND EXISTING 2ND-GENERATION BIOFUEL FACILITIES IN EUROPE

Country	Place / COMPANY	Technology	in operation	Capacity / Production (Current or Forecast)
Austria[1]	Güssing	demonstration plant of the FT synthesis	NO in future	This demonstration plant will be big enough to refuel a fleet of vehicles in the city of Güssing
Denmark[1]	Kalundborg - GENECOR	pilot cereal-to-biofuel facility	NO in future	4.500 tons of cellulosic ethanol per year
Denmark[1]	Bornholm - BIOGASOL	pilot plant producing lignocellulosic ethanol	NO in future	8.000 tons of cellulosic ethanol per year
Finland[1]	Varkaus - STORA ENSO	syndiesel pilot plant using forest residue and pulp/paper waste	NO end of 2008	
France[3]	Pomacle-Bazancourt (Marne) FUTUROL PROJECT	pilot facility	in 2008	
France[1]	not yet defined	pilot plant producing lignocellulosic ethanol	NO in future	100 tons of cellulosic ethanol per year
France[1]	Bure (Lorraine) - AXENS	pilot plant using Fischer-Tropsch technology	NO in future	15.000 tons per year
Germany[2]	α-plant	Pilot plant converted to a Fisher-Tropsch unit in 2002	1997/1998	several tons of FT until 2005
Germany[2]	Freiberg - UET/CHOREN	first commercial BtL plant (β-plant)	YES from 2007	45 MW (360 barrel per day) from 2008: 15000 t/a of BtL
Germany[2]	CHOREN	standard production plant	NO 2011	200.000 t/a BtL (5000 barrels per day) fuel
Germany[2]	Karlsruhe - FZK	Pyrolysis pilot plant	YES end of 2007	capacity of 500 kg biomass per hour (2 MW)
Sweden[2]	Hofors	Pilot and demonstration black liquor gasification plant	1987	0.5 MW
Sweden[2]	Skogall	pressurized (15 bar) air-blown pilot plant	built in 1994 modified in 1997	1 MW
Sweden[2]	Pitea - Sodra	pressurized, 30 bar oxygen-blown development gasifier	YES 2005	3 MW Volvo is planning a test fleet of about 15 heavy duty trucks to be ready for the end of 2009. DME for this fleet is planned to be produced from gas from the DP-1 plant in Piteå which then will be equipped with a pilot plant for DME production with a capacity in the order of 4-5 tons/day
Sweden[2]	not yet defined	BLGMF (Black Liquor Gasificator for Motor Fuel)	end of 2010	25,000 tons/year of fuel grade DME equivalent to ~17,000 t diesel/year
Sweden[2]	not yet defined	2 BLGMF demonstration plants	end of 2010	The production calculated for all Swedish plants at the end of 2020 is almost 600.000 Ton diesel Oil Equiv. Per year
Sweden[2]	not yet defined	3 small BLGMF plants	2014-2018	
Sweden[2]	not yet defined	5 large BLGMF plants	2012 -	

Country	Place / COMPANY	Technology	in operation	Capacity / Production (Current or Forecast)
			2020	
Sweden[1]	Örnsköldsvik - SEKAB	pilot plant producing lignocellulosic ethanol	YES 2005	100 tons of cellulosic ethanol per year
Spain[1]	Babilafuente - ABENGOA BIOENERGY	pilot plant producing lignocellulosic ethanol	YES 2007	4000 tons of cellulosic ethanol per year
The Netherlands[1]	Sas Van Gent - ROYAL NEDALCO	pilot plant producing lignocellulosic ethanol	in future	160.000 tons of cellulosic ethanol per year

Source :

1) IFP Innovation Energy Environment Panorama 2008 -"2nd generation pilot biofuel units worldwide

2) Renewable Fuels for advanced Powertrains, Final Report. Renew 2008

3) FUTUROL PROJECT