

Diekmann, Jochen

Article

Renewable Energy in Europe: Strong Political Will Required for Ambitious Goals

Weekly Report

Provided in Cooperation with:

German Institute for Economic Research (DIW Berlin)

Suggested Citation: Diekmann, Jochen (2009) : Renewable Energy in Europe: Strong Political Will Required for Ambitious Goals, Weekly Report, ISSN 1860-3343, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin, Vol. 5, Iss. 36, pp. 242-250

This Version is available at:

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Weekly Report

Renewable Energy in Europe: Strong Political Will Required for Ambitious Goals

A number of substantive goals and mechanisms for implementing an integrated climate and energy policy have been ratified over the last two years at the European level. By 2020, greenhouse gas emissions in Europe are to be reduced by at least 20 percent; energy efficiency improved by 20 percent; and the share of energy from renewable sources increased to 20 percent. According to a recent European Council decision, by 2050 greenhouse gas emissions in Europe are to be reduced by as much as 80 to 95 percent. In June of 2009 a new EU Directive was enacted for the promotion of renewable energy. The Directive sets binding goals for the share of energy from renewable sources in the 27 Member States by 2020 while also defining conditions for their achievement. The Directive replaced existing EU directives that had only set non-binding targets for electricity and fuels from renewable energy for 2010. These Directives have only been of limited effectiveness.

Individual EU Member States must now immediately address how they plan to meet these requirements by devising and implementing appropriate domestic policy measures. Germany is in a good starting position for the further expansion of renewables, particularly because of its overhauled Renewable Energy Sources Act (EEG) and the new Renewable Energy Heat Act (EEWärmeG). Nevertheless, the new German government faces great challenges in integrating larger amounts of renewable energy into the energy economy at an accelerated pace.

Some 80 percent of Europe's energy supply currently comes from fossil fuels. In 2006, primary energy consumption in the EU was comprised of 36.9 percent oil, 24.0 percent natural gas and 17.8 percent solid fuels, such as coal (Figure 1). Nuclear energy accounted for 14.0 percent.¹ Renewable energy sources as a whole represented 7.1 percent of total primary energy consumption. Biomass and hydroelectric power were dominant, while other energy sources, such as wind power, geothermal power, and solar energy, accounted only for a small proportion of total consumption.

¹ According to the so-called „efficiency method“, nuclear energy is rated three times higher than hydroelectric power. For this reason, the relative contribution of these energy sources can be better compared based on their contributions to electricity generation.

Jochen Diekmann
jdiekmann@diw.de

JEL Classification:
Q2, Q4, Q5

Keywords:
Renewable Energy, Promotion Policy,
European Union

By 2006, the dependence of the EU on energy imports had increased to 53.8 percent. In 1996, by contrast, imports only made up 44.1 percent of energy supplies.² Import dependence is especially high for oil (83.6 percent) and rapidly rising for natural gas (60.8 percent). Rising dependence upon regionally concentrated and globally diminishing energy resources entails increased risks for security of supply.

The use of fossil fuels, especially coal, is also responsible to large extent for the emission of climate-damaging greenhouse gases. Total per-capita emissions in Europe in 2006 were 10.4 tons of CO₂ equivalents. While per-capita emissions were twice as high in the US, European emissions levels are nevertheless double the world average.

European countries disagree about the role that nuclear energy should play. While nuclear energy is used to generate 78 percent of France's electricity, the overall percentage in the EU is 30 percent, and twelve (mostly smaller) Member States produce no electricity from nuclear energy. In the European Commission's reference scenario, the share of nuclear energy in electricity generation will fall to 20 percent by 2030 in the EU.³

Increasing Importance of Renewables in European Energy Policy

The rapid expansion of renewable energy would make a significant contribution to sustainable development, to the security of energy supply, and to environmental safety. By accelerating deployment, the costs of green technologies (which, to some extent, remain high) will steadily decrease. This, in turn, will encourage innovation, accelerate structural change, and open up new opportunities for growth in international competition.

As early as 1997, the European Commission was advocating that the share of energy generated from renewable sources be doubled by 2010, and, to this end, called for appropriate policy changes.⁴ Long discussions ensued concerning suitable support schemes and their coordinated implementation within the European Community. As a result of these negotiations, in 2001 a Directive was ratified by the European Parliament and Council specifically

² If not otherwise designated, statistical data in this report are based upon data from Eurostat and pertain to the EU-27.

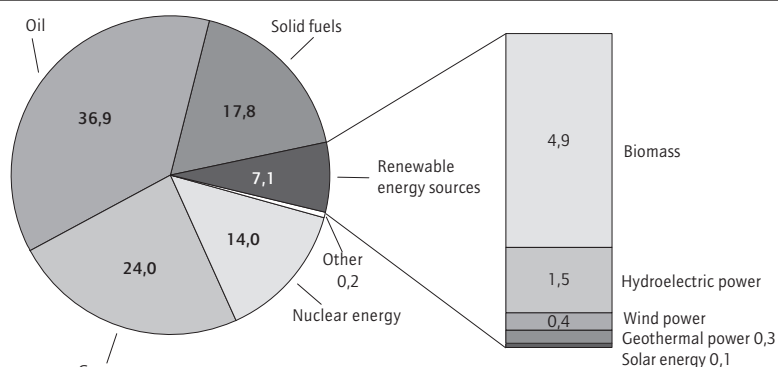
³ European Commission, Directorate-General for Energy and Transport: Trends to 2030—Update 2007, Luxembourg, April 2008.

⁴ European Commission: Energy for the Future: Renewable Sources of Energy, White Paper for a Community Strategy and Action Plan, Brussels 1997.

Figure 1

Primary Energy Consumption in Europe, 2006

Share in percent



Source: Eurostat.

DIW Berlin 2009

for the promotion of electricity from renewable sources.⁵ In 2003 an additional Directive followed for the use of fuels from renewable energy.⁶ These directives established non-binding targets for 2010 as well as numerous procedures, particularly for monitoring.

In a broader time frame, the European Council decided in March 2007 that the share of renewable energy in total energy consumption should increase to 20 percent by 2020. It was also ruled that by 2020, energy efficiency should increase by 20 percent (compared to reference forecasts) and that the release of climate-damaging greenhouse gases should decrease by at least 20 percent (compared to 1990 levels).⁷ At the beginning of 2008, the European Commission presented concrete policy recommendations for a comprehensive energy and climate package. This package contained a substantive revision of the emissions trading Directive, emissions reduction targets for not covered sectors, and a concrete legal framework for the promotion of renewable energy.⁸ The new Directive for the

⁵ Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity from renewable energy sources in the internal electricity market, Official Journal of the European Union, L283 of 27 October 2001.

⁶ 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, Official Journal of the European Union, L 123 of 17 May 2003.

⁷ Subject to international climate negotiations, Europe will commit itself to reduce greenhouse gas emissions by 30 percent by the year 2020. By 2050, the aim is to reduce emissions by up to 80 or 95 percent. See Council of the European Union: EU position for the Copenhagen Climate Conference (7-18 December 2009) - Council conclusions, 14790/09, ENV 711, Brussels, 21 October 2009.

⁸ See European Commission: Climate Action, Energy for a Changing World, <http://ec.europa.eu/climateaction/>. For an analysis of the effects of the total package, see Commission of the European Communities: Annex to the Impact Assessment. Document Accompanying the Package of Implementation Measures for the EU's Objectives on Climate Change and Renewable Energy for 2020. Commission Staff Working Document, SEC (2008) 85, VOL. II, Brussels, 27 February 2008. For the interplay bet-

Table 1

Target Levels for Renewable Energy in Europe and Germany

In percent

	Europe	Germany
Targets for 2010		
Share in electricity consumption ¹	21	12.5
Share in transport fuel consumption ²	5.75	5.75
Targets for 2020		
Share in gross final consumption of energy ³	20	18
Share in electricity consumption ⁴	–	30
Share in transport fuel consumption ⁵	10	12
Share in heating consumption ⁶	–	14

¹ Directive 2001/77/EC² Directive 2003/30/EC³ Directive 2009/28/EC⁴ EEG 2009⁵ Directive 2009/28/EC, BMU l.c.⁶ EEWärmeG, 2008

Source: Compiled by the DIW Berlin

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promotion of renewable energy was passed in 2008 and has been in effect since June 2009.⁹ For the first time, binding targets for 2020 are now in force for renewable energy as a share of total energy consumption (20 percent) and as a share of transport fuel consumption (10 percent).

Table 1 presents an overview of the target levels set by the three EU Directives for 2010 and 2020 in Europe. For comparison, the corresponding targets for Germany are presented. Germany had already set legally binding goals for 2020 for renewable electricity (at least 30 percent) and for the heating sector (14 percent) (EEG, 2009; EEWärmeG, 2008).

Earlier Directives that Set Targets for 2010 Were Only of Limited Success

Electricity from Renewables

The production of electricity from renewable sources has expanded considerably in Europe over the past two decades (Figure 2). In this connection, electricity from biomass and wind power has increased with particular speed. The still-dominant share contributed by hydroelectric power has fluctuated greatly depending upon weather conditions. Only a slight increase has been registered to date

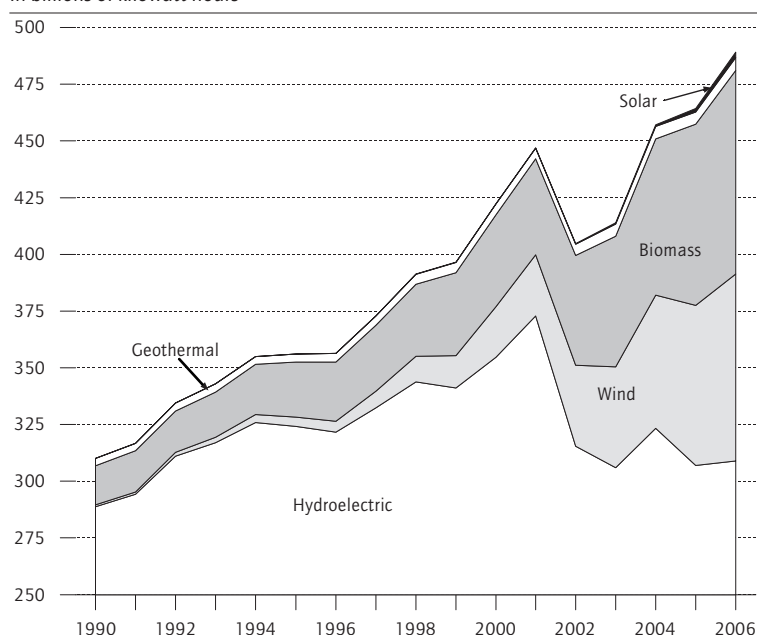
between renewable energy promotion and emissions trading, see Kemfert, C., Diekmann, J.: Emissions Trading and Promotion of Renewable Energy – We Need Both. DIW Berlin Weekly Report 14/2009.

⁹ Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, Official Journal of the European Union, L 140 of 5 June 2009.

Figure 2

Gross Electricity Generation from Renewables in Europe

In billions of kilowatt hours



Source: European Commission, Directorate-General for Energy and Transport (DG TREN).

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for electricity production from geothermal plants. Solar electricity enjoys the highest growth rate, but its overall contribution to electricity production is still relatively small.

Because of increasing electricity consumption, the share of electricity generated from renewable energy has risen less steeply. Between 1990 and 2006, it rose in Europe from 11.8 percent to 14.6 percent. In 2007 it reached 15.6 percent and was thus only slightly higher than when the first EU Directive came into force in 2001 (14.4 percent).

The level and composition of renewable energy as a share of electricity consumption differs considerably between Member States (Figure 3). Natural resources contribute significantly to this variation, particularly with regard to hydroelectric power (for example, in Austria and Sweden), the use of biomass (for example, in Finland and Denmark) and geothermal energy (Italy). Yet the effectiveness of national promotion policies is also making itself evident, particularly in terms of the varying significance of wind power (for example, in Denmark, Germany, and Spain), solar electricity (in Germany and Luxembourg) and the increasing use of biomass, including biogas, in a number of countries.

As renewable-energy targets for 2010 were developed in 2001, the unique situation faced by each

Member State in terms of the current domestic deployment of renewables and growth potentials were taken into account (Figure 4). The targets set for renewable energy as a percentage of total electricity consumption ranged from 3.6 percent in Hungary all the way up to 78.1 percent in Austria. These targets have been pursued with varying degrees of success. While Germany and Hungary had already exceeded their targets by 2007 (12.5 percent and 3.6 percent, respectively),¹⁰ other countries—such as Austria, Slovakia, Greece, Latvia, and Slovenia—were still a long way from reaching them.

In the EU as a whole, the share of renewable energy had risen to 15.6 percent in 2007. Prevailing trends indicate that Europe's 2010 renewable-energy targets (originally 22 percent for the EU-15 and 21 percent for the EU-25/EU-27) will not be fully achieved. In its most recent progress report (based on data up to 2006), the European Commission also shares this view.¹¹

A key reason for the divergent rates of progress by Member States is that, despite a number of improvements (for example, feed-in tariffs, or technology-dependent quota systems), support schemes are not yet continuous or effective enough in many countries. Alongside these problems, administrative hurdles also hinder permit processes and network access.¹²

Since 2004, the Commission has opened 61 legal proceedings against member states for non-compliance with Directive 2001/77/EC, 13 of them against Italy alone. These facts further demonstrate that the legal framework of the Directive is inadequate and cannot guarantee that the targets in the electricity sector will be reached by 2010.

Biofuels

The so-called Biofuels Directive (2003/30/EC) specifies reference targets for 2005 and 2010 of 2

¹⁰ In Germany, the share of renewables in gross electricity consumption increased to 15.1 percent in 2008. See Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU): Erneuerbare Energien in Zahlen. Nationale und internationale Entwicklung, June 2009 edition. Berlin 2009.

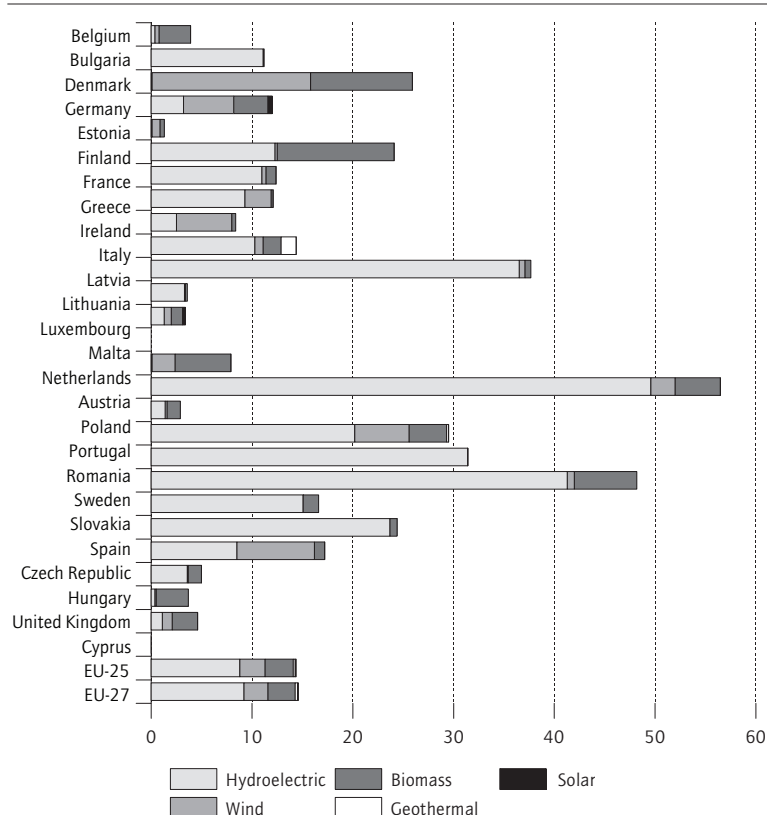
¹¹ European Commission: Communication of the Commission to the Council and the European Parliament. „Renewable Energy Progress Report: Report of the Commission as per Article 3 of Directive 2001/77/EC and Article 4, Paragraph 2 of Directive 2003/30/EC as well as implementation of the EU Action Plan for Biomass (COM (2005)628). COM (2009) 192 final, Brussels, 24 April 2009. On the basis of normalized data for hydroelectric power, the share of renewable energy in electricity consumption rose from 14.5 percent to 15.7 percent between 2004 and 2006.

¹² See Diekmann, J., Kemfert, C., Erneuerbare Energien: Weitere Förderung aus Klimaschutzgründen unverzichtbar, DIW Berlin Wochenbericht 29/2005; DIW, DLR, ZSW, IZES: Economic Analysis and Evaluation of the Effects of the Renewable Energy Act. Study commissioned by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Berlin 2008.

Figure 3

Electricity from Renewables¹ by Energy Source, 2006

Share in percent



¹ Gross electricity generation from renewable energy as a share of total gross electricity generation and net electricity imports.

Source: Eurostat.

DIW Berlin 2009

percent and 5.75 percent respectively. In 2005, the reference targets were achieved only by Sweden and Germany; the average overall share in Europe of about one percent was clearly below the target level (see Figure 5). Since then, however, growth has generally accelerated. In 2007, the share of biofuels in the transportation sector was 2.6 percent. If this trend continues, by 2010 a figure of only 5 percent will have been reached—here, as well, additional efforts are clearly needed.

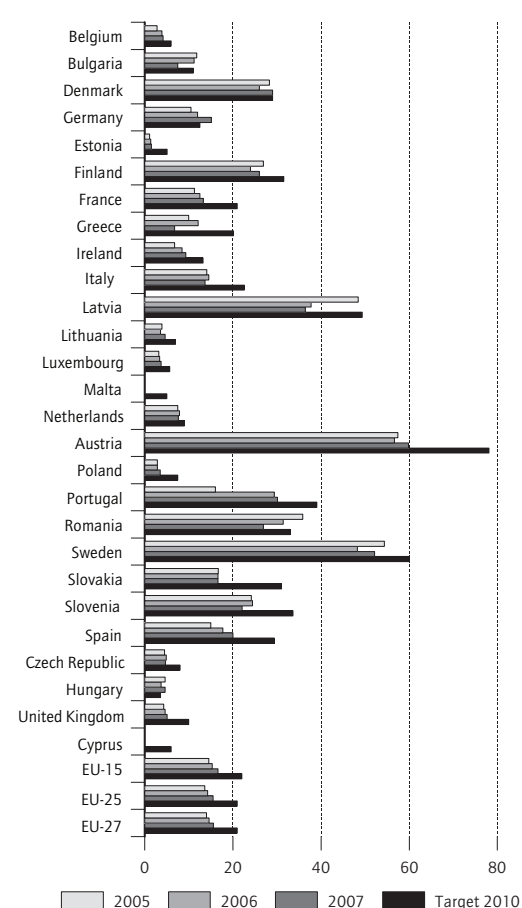
Among biofuels, biodiesel predominates with a share of 75 percent, 26 percent of which was imported. Bioethanol had a 15 percent share, of which 31 percent was imported. In addition, pure plant oil and biogas accounted for 10 percent of biofuels. Other sources from renewable energy such as solar electricity or hydrogen are still insignificant.

Among support measures, tax privileges predominate, alongside increasing obligations for the use of biofuel mixtures. Due to a lack of promotional

Figure 4

Electricity from Renewable Energy Sources¹ 2005 to 2007 and Targets for 2010

Share in percent



¹ Gross electricity generation from renewable sources as a share of total gross electricity generation and net electricity imports.

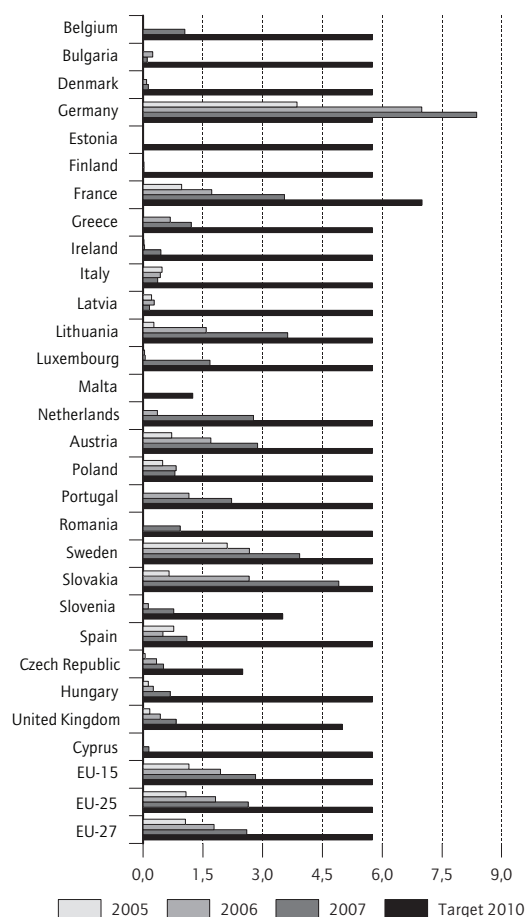
Source: Directive 2001/77/EC, Progress Report COM(2009) 192 final; Eurostat 2009.

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Figure 5

Use of Biofuels 2005 to 2007 and Targets for 2010

Share in percent



Source: Directive 2003/30/EC, Progress Report COM(2009) 192 final; Eurostat 2009.

DIW Berlin 2009

efforts, little or no progress has been witnessed in one third of member states to date. Consequently, the attainment of the 2010 targets appears unlikely.

Since 2005, the Commission has started 62 proceedings for breach of contract against Member States on the basis of non-compliance with Biofuels Directive 2003/30/EC; Italy, Greece, and Finland have each been the subject of 5 proceedings. In many instances, reporting obligations were breached or no adequate national goals had been set.

Against this backdrop, the achievements of the earlier Directives in the electricity and transport fuel sectors have been limited. In both sectors, some significant steps have been made, but it is likely that

the goals for 2010 will not be attained. Obviously, previous non-binding European legal frameworks for renewable energy in the electricity and fuel sectors have been insufficient.

The heating sector has been seriously neglected to date. At the European level, there has been a complete lack of goals and no framework for national policy measures to promote renewable energy in the heating sector.

Table 2

Share of Renewable Energy¹ in Gross Final Consumption of Energy²

In percent

	2000	2001	2002	2003	2004	2005	2006
Belgium	1.1	1.3	1.3	1.5	1.7	2.3	2.6
Bulgaria	7.7	7.6	8.5	8.3	8.8	9.1	9.0
Denmark	11.7	12.2	13.3	14.8	16.0	17.3	17.1
Germany	3.7	4.2	4.8	4.9	5.6	6.5	7.8
Estonia	16.0	15.4	15.6	16.5	18.8	17.8	16.6
Finland	28.9	27.9	28.4	27.9	29.2	28.5	28.9
France	10.6	10.1	10.1	10.2	10.2	10.3	10.4
Greece	7.2	7.1	7.0	6.6	6.8	6.9	7.2
Ireland	1.9	2.1	2.1	2.0	2.3	2.8	3.0
Italy	4.8	4.9	5.5	4.7	5.2	5.8	6.3
Latvia	33.3	33.2	32.4	32.9	33.3	32.6	31.4
Lithuania	15.0	15.3	15.2	15.3	15.2	14.8	14.6
Luxembourg	0.9	0.9	0.9	0.9	0.9	1.0	1.0
Malta	–	–	–	–	–	–	–
Netherlands	1.6	1.6	1.6	1.8	2.0	2.4	2.7
Austria	25.1	25.1	24.1	23.2	23.9	23.5	25.2
Poland	6.5	6.9	7.2	7.1	7.1	7.2	7.5
Portugal	19.5	19.1	19.3	19.4	18.2	20.3	21.5
Romania	16.9	14.0	14.8	16.3	16.4	17.6	17.1
Sweden	37.7	37.2	36.5	37.3	38.2	39.5	41.4
Slovakia	3.2	5.8	4.9	5.5	5.9	6.5	6.8
Slovenia	16.4	16.2	16.7	16.4	16.2	16.0	15.5
Spain	8.2	8.1	8.2	8.5	8.3	8.5	8.7
Czech Republic	2.1	2.3	2.9	4.3	6.0	6.1	6.4
Hungary	2.8	2.6	4.8	4.7	4.4	4.3	5.1
United Kingdom	0.9	0.9	1.0	1.1	1.2	1.3	1.5
Cyprus	2.7	2.5	2.6	2.6	2.6	2.6	2.7
EU-27	7.5	7.5	7.8	7.9	8.2	8.7	9.2

1 The share of renewable energy in gross final energy consumption is the sum of final energy consumption from renewable energy sources for heating, gross electricity generation from renewable energy sources, and the consumption of biofuels in transportation.

2 Gross final consumption of energy including consumption within the energy sector and distribution losses (electricity, heat). Electricity generation from hydropower is normalized (on the basis of average generation over a 15-year period).

Sources: Eurostat. DG TREN.

DIW Berlin 2009

New Directive with Binding Goals for 2020

With its enactment, Directive 2009/28/EC set mandatory targets for the share of renewable energy in total energy consumption (for electricity, heat, and fuels), as well as a target for the share of renewables in transport fuel consumption. The total share of renewable energy is expressed in terms of “gross final consumption of energy,” which comprises final energy consumption for heating, gross electricity generation, and the use of fuels in transportation.¹³ Table 2 shows how the share of renewable energy changed in the Member States between 2000 and 2006. In the EU the share of renewable energy during this time period (when the annual generation of

hydroelectric power is normalized) increased from 7.5 percent to 9.2 percent. By 2020, this total share will have to more than double.

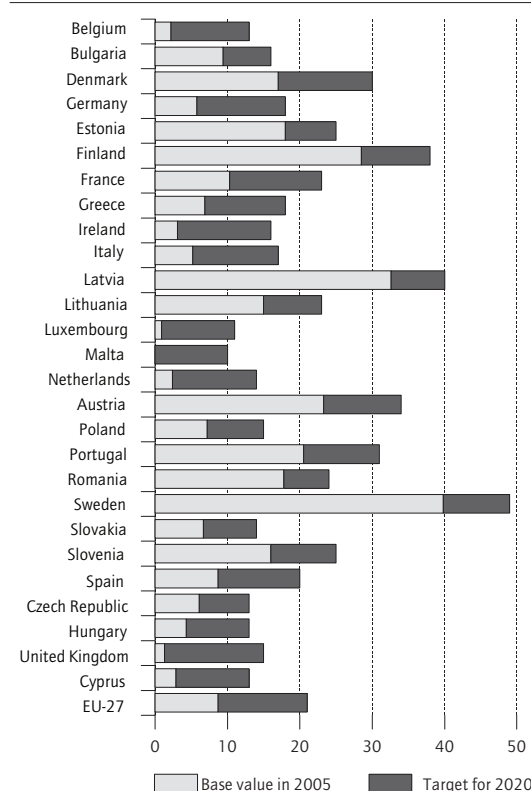
In order to achieve the overall target of renewables accounting for 20 percent of all European consumption by 2020, mandatory national goals are set in the Directive for each Member State (Figure 6). In accordance with the Commission's proposal, national goals were defined based on each country's renewable share in 2005 while considering particular progress (i.e. an increase of more than two percentage points) in the period from 2001 to 2005. Every country will have to increase its adjusted share by 5.5 percentage points. The remaining burden of increasing the overall European share to 20 percent was divided up based on per capita GDP and population figures. The resulting target values range from ten percent for Malta up to 49 percent for Sweden. For Germany, the target for 2020 is 18 percent.

13 It should be noted that gross final consumption of energy also includes energy losses within the energy sector, and thus differs greatly from the energy statistics term “final energy consumption”. In addition, it is differentiated from the term “primary energy consumption”, which is calculated using the so-called “efficiency method”.

Figure 6

Share of Renewable Energy in Gross Final Consumption of Energy in 2005 and Targets for 2020

In percent



Sources: Directive 2009/28/EC of 23 April 2009, Eurostat. **DIW Berlin 2009**

Alongside the mandatory targets for 2020, the Directive also includes formulas for indicative trajectories that should be achieved; average values must be met at two-year intervals up to 2020. Figure 7 displays this trajectory for Germany. At least for the time being, the trajectory does not appear very onerous, since the 2013/14 required share of 9.5 percent for Germany has already been attained.¹⁴

Improving Efficiency through Flexible Mechanisms

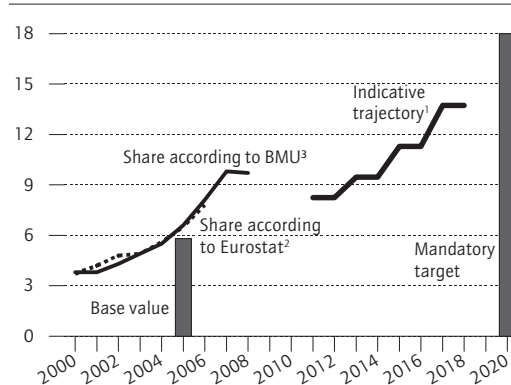
In the establishment of national goals (and trajectories), the fair sharing of burdens among Member States is a primary goal. Since efficiency criteria based upon diverging costs and potentials for using renewable energy are not included directly, a

¹⁴ According to BMU, the share of renewable energy in final energy consumption was 9.8 percent in 2007, but it fell to 9.5 percent in 2008. It should be noted that the data from Eurostat and BMU for earlier years differed slightly from each other.

Figure 7

Share of Renewable Energy in Gross Final Consumption of Energy in Germany

In percent



¹ The indicative trajectory is set as an average value for each two-year period (2011-12, 2013-14, 2015-16, 2017-2018).

² With normalized values for production from hydroelectric power.

³ German Federal Environmental Ministry (BMU).

Sources: Directive 2009/28/EC of 23 April 2009, BMU 2009. **DIW Berlin 2009**

number of flexible mechanisms are envisaged in the Directive, including:

- the statistical transfer of renewable energy between Member States (i.e. in terms of accounting, not physical delivery), which can count toward target achievement (Article 6);
- joint projects between Member States in the electricity, heating, and cooling sectors, with the selectable attribution of goal contributions (Articles 7 and 8);
- joint projects between Member States and third party nations for generating electricity from renewable energy with newly installed capacities¹⁵ (Articles 9 and 10); and
- joint or coordinated support schemes between Member States on a voluntary basis, tied to statistical transfer or to a distribution rule for the recognition of generated renewable energy (Article 11).

Guarantees of origin (GO) must be provided for electricity and heat from renewable energy. These guarantees serve to inform end consumers that they are dealing with energy from renewable sources. However, in contrast to the Commission's original proposal, guarantees of origin will not be incorporated into the evaluation of Member States with respect to their attainment of targets, and thus will not form a foundation for an incentive policy for

¹⁵ For example, importing solar electricity from North Africa, see Kemfert, C., Schill, W.-P.: Power from the Desert: Not a Mirage, DIW Berlin Weekly Report 24/2009.

GO trading in Europe. This will avoid upsetting the functionality of existing and diverse nationally based incentive systems, including technology- and site-dependent compensation systems for feed-in tariffs, and national quota obligations with tradable green certificates.

For the transportation sector, the directive mandates that by the year 2020, every Member State cover at least 10 percent of its energy consumption with renewables.¹⁶ Since biofuels are easily traded internationally, the setting of varying national goals in this area has been avoided. Imports from non-EU countries will count towards the calculation of the attained share. In addition to biofuels, other forms of energy from renewable sources, such as solar electricity or hydrogen, will also be taken into account.

An important prerequisite for employing biofuels and bioliquids is that sustainability criteria be observed. These criteria are related to targeted greenhouse gas reductions and land use (for example, with respect to biological diversity). In addition, possible conflicts with the cultivation of food crops and the social implications of bioenergy production also need to be taken into account.¹⁷

Greater Need for Action by Member States

The new directive has substantially improved the legal framework for renewable energy in Europe. The responsibility for reaching targets continues to fall on Member States, who are now obliged to formulate and implement effective policy measures.

Every Member State is required to develop a national action plan by June 2010 that presents targets for the electricity,¹⁸ heating and transport fuel sectors along with corresponding measures and, where applicable, the planned use of flexible mechanisms.¹⁹ Any expected surpluses or deficits must be reported by the end of 2009. If the indicative trajectory is not reached, the Commission may demand revision of the action plan.

¹⁶ Gasoline and diesel transport fuels, biofuels used in road and rail transportation, and electricity were considered as reference values.

¹⁷ Sustainability criteria for solid and gaseous bioenergy sources remain to be specified.

¹⁸ The shares for electricity from renewable energy sources are also significant because of their interaction with emissions trading. See Kemfert, Diekmann, I.c.

¹⁹ For this purpose, the Commission has since published a template, see Commission Decision of 30 June 2009 establishing a template for National Renewable Energy Action Plans under Directive 2009/28/EC of the European Parliament and of the Council (notified under document number C(2009) 5174) (2009/S48/EC) Official Journal of the European Union L 182, 15 July 2009.

Aside from support schemes, measures are also to be implemented by the Member States with regard to statutory provisions and administrative procedures (for example, in building regulations), informational efforts and education, guarantees of origin, sustainability requirements, and not least of all, network access and management, including infrastructure construction. By the end of 2011 and every two years thereafter, Member States are required to submit comprehensive reports to the Commission about their progress and measures they are taking to meet their goals. Like the action plans and forecasts, these reports will be made available to the public on a transparency platform.

Germany is in a Good Starting Position, but Faces Great Challenges

Germany is currently well positioned to further expand its use of renewables. Targets and policy measures for electricity and heating have already been set by the overhauled Renewable Energy Act (EEG 2009) and the 2009 Renewable Energy Heat Act (EEWärmeG). Within the framework of the market incentive program, the heating sector will be subsidized by up to 500 million euros annually over the next several years. KfW, a development bank owned by the German government, has been awarding low-interest loans for a number of programs. Renewable energy in the transportation sector will be promoted by the Biofuel Quota Act, passed in 2006.

The coalition agreement signed by Germany's new government on October 26, 2009, foresees the continued promotion of renewable energy based on existing targets. However, meeting these targets will entail surmounting considerable challenges. In the electricity sector, for example, requirements for market and network integration need to be improved. In the heating sector, policy measures need to be strengthened, particularly with regard to existing building stocks, and in the bioenergy sector, sustainability standards need to be implemented. In addition, the government needs to maintain the effectiveness of existing support schemes while continuing to improve their efficiency on the basis of monitoring the costs and incentives.

Conclusion

Now that ambitious goals have been set for the expansion of renewable energy in Europe, the challenge is to implement concrete policies for goal attainment in a coordinated fashion. By 2020, renewable energy is mandated to comprise 20 percent

of gross final energy consumption in Europe. In order to accomplish this, the 9 percent share achieved by the year 2006 will need to be more than doubled.

Previous EU Directives passed in 2001 and 2003 to promote electricity and transport fuels from renewable energy sources were, as a whole, only of limited effectiveness. In many nations, considerable efforts were actually initiated. In other countries, however, very little was done and the targets set remain quite distant. As a whole, the renewables share in 2007 was 15.6 percent for electricity and 2.6 percent for transport fuels. Consequently, it is unlikely that the targeted shares for 2010 (i.e. 21 percent in the electricity sector and 5.75 percent in the transport fuels sector) will be achieved.

The new EU Directive for promoting the use of renewable energy that came into effect in June of 2009 establishes a new foundation for energy policy. For the first time, it sets mandatory goals for the share of renewable energy in the 27 Member States, includes the previously ignored heating sector, and establishes formulas for indicative trajectories. With binding national targets and the requirement for concrete national action plans and progress reports, it seems more likely than ever that the targeted growth of renewable energy in Europe will be achieved.

Member States must now prepare and implement appropriate policy measures for meeting these requirements. In many countries, support schemes need to be strengthened, legal and administrative obstacles dismantled (for example, regarding installation permits), and informational efforts and education improved, among other things.

At the moment, Germany is well positioned to further expand its use of renewable energy. Reliable political support will continue to be necessary in the future if European targets for renewable energy are to be met. Additional action is needed first and foremost to: improve the grid integration of fluctuating electricity supply; promote the use of renewable energy for heating in existing building stocks; and implement sustainability standards for biofuels. Furthermore, the efficiency of existing support schemes needs to be continuously improved through monitoring the costs and incentives.

(First published as "Erneuerbare Energien in Europa: Ambitionierte Ziele jetzt konsequent verfolgen", in: Wochenbericht des DIW Berlin Nr. 45/2009.)

DIW Berlin
Mohrenstraße 58
10117 Berlin

Tel. +49-30-897 89-0
Fax +49-30-897 89-200

ISSN 1860-3343
Translated from the German.
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