VOLUME 3

ERENE

European Community for Renewable Energy

A feasibility study by **Michaele Schreyer** and **Lutz Mez**

HEINRICH BÖLL STIFTUNG
EUROPE

ERENE – EUROPEAN COMMUNITY FOR RENEWABLE ENERGY

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This publication has been produced with the support of the European Union, programme "Europe for Citizens: Structural Support for Civil Society Organisations at the European Level"

ERENE – European Community for Renewable Energy
Volume 3 (english edition) in the publication series on Europe

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Commissioned and published by the Heinrich Böll Foundation

Layout: Graphic Syndicate Michael Pickardt (based on a design by blotto Design, Berlin)
Printed by: Agitdruck

ISBN 978-3-927760-94-3

This publication can be ordered from Heinrich-Böll-Stiftung, Schumannstr. 8, D-10117 Berlin
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HEINRICH BÖLL STIFTUNG
PUBLICATION SERIES ON EUROPE

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PREFACE

Why a European Community for Renewable Energy (ERENE)?

The European Union must set itself ambitious goals if it wants to maintain its political dynamic and the support of the people of Europe. An 80–90% reduction of European carbon dioxide emissions by the middle of this century should therefore be a core project of the EU. Through this the EU would make a major contribution to the protection of the global climate while simultaneously guiding the European economy on to sustainable routes, creating hundreds of thousands of new jobs. This would call for nothing less than a new industrial revolution with a huge increase in the efficiency of the use of resources and the coverage of the bulk of energy demands with renewable energy as its central theme.

A first step in this direction was taken by the European Council in March 2007 by setting the targets for reducing carbon dioxide emissions in the EU and increasing the share of renewable energies by 20% by the year 2020. It is doubtful whether these targets, which are only minimum requirements, can be achieved with existing instruments and strategies. This is even more uncertain for the more ambitious aim to cover the European electricity demand exclusively with renewable energies by the middle of this century. There is a large wind, solar, biomass, geothermal and hydroelectric potential in Europe, although it is unevenly distributed across the EU. In the EU as a whole, only about one-tenth of that potential is currently being used for the generation of electricity from renewable energy sources.

In order to exploit this potential, to speed up the development of renewable energy and to encourage co-operation within the EU, new instruments are needed. ERENE (European Community for Renewable Energy) aims to become such an instrument.

The European Coal and Steel Community, which had the security of energy supplies for Member States as a central goal, was at the origin of European unification. The next European Community initiative in the field of energy policy was EURATOM (European Atomic Energy Community), which was intended to promote the use of nuclear energy and thereby reduce Europe's dependency on imported energy. In the meantime, however, this supposed "industry of the future" has proven itself to be a billion-dollar grave.

ERENE will go in another direction, avoiding the risks of nuclear energy and making Europe a pioneer of modern energy supply for the 21st century by covering its energy needs from renewable energy sources. Analogously to EURATOM, ERENE could be a new community founded on its own treaty, or could be established by a Council decision under the umbrella of the EU.

Alongside its other mainstays – namely energy savings and the more efficient use of energy – we see this proposal as part of an integrated European strategy. ERENE should concentrate on increasing the use of renewable energy sources in the EU by

common action and networks. Transnational programmes and projects should create a win-win situation for Member States by taking advantage of economies of scale, a common market for renewable energy and by sharing costs.

The principle of subsidiarity should likewise apply to ERENE, which means that actions shall only being taken at a European level when the objectives cannot be attained fully at the local or national levels, or can only be attained under unfavourable conditions. Therefore, ERENE should be given the following competencies in order to carry out its mission:

- To support transnational research in renewable energy. Especially when comparing the resources assigned to nuclear research, there is a lot of catching up to do;
- To promote innovation through the establishment of demonstration facilities;
- To contribute to the creation of an intelligent European electricity grid to include a large number of different decentralised renewable energy sources, which are crucial to the development of sustainable energy supply;
- To support investment in electricity generation from renewable energy sources;
- To contribute to the functioning of a single European electricity market based on renewable energy;
- To promote co-operation with other countries on renewable energy sources, in particular with Mediterranean countries because of their enormous solar energy potential.

We wish to thank the authors of this study, Michaele Schreyer and Lutz Mez, as well as David Jacobs for his collaboration. Without their extensive knowledge and institutional experience in the complex area of European energy and other policies, we would have been unable to complete this project so successfully; we hope that the study will attract the attention of the public and of policymakers, which it deserves.

Berlin, May 2008

Ralf Fücks
Executive Board, Heinrich Böll Foundation

EXECUTIVE SUMMARY

Alongside the twin pillars of improving energy efficiency and energy savings, renewable energy plays a key role in any sustainable European energy policy. It contributes to the fight against climate change. It lowers the European Union's (EU) import dependency, thereby increasing security of supply and decreasing reliance on volatile oil, gas and uranium prices. The EU's international competitiveness is also boosted by technological developments in this up-and-coming industry.

By virtue of its geological, climatic and hydrological conditions, Europe has every available renewable energy source at its disposal. Hydro, wind, solar thermal, photovoltaic, geothermal, wave and tidal sources, as well as biomass, can all be used for power generation, albeit not in every European country or region. Estimates show that EU Member States, Norway, Iceland, Switzerland and the EU candidate countries Croatia and Turkey, as well as the western Balkan countries, possess a combined economic potential for "green electricity" production that far surpasses current and future projections of electricity demand.

Currently, however, Europe uses only a fraction of its green electricity potential. In the European Economic Area (EEA), only Iceland and Norway completely cover their electricity demand with energy generated from renewable sources, while the rest of Europe taps this potential to a limited extent only, if at all. The considerable capacity of renewable sources other than hydro power to generate electricity remains underutilised in most European countries. In the west of the EU – Ireland, the United Kingdom and France, for example – fail to use their great potential for wind power. In the north, the Scandinavian states have more biomass, hydro and wind power capacities than they currently use. In central and eastern Europe, Poland alone has more than 100 TWh of green electricity potential, which currently goes unused. Germany's renewable electricity potential is six times higher than that produced at present. The EU's potential to generate electricity from wind is estimated to be 20 times higher than the amount produced in 2005. In addition, solar thermal power plants situated in such Member States and candidate countries in or near the Earth's sunbelt could supply almost half of the EU's electricity needs.

The exploitation of renewable energy in Europe is still in its infancy.

While the European Union has set the target to generate 20% of its overall final energy consumption from renewable sources by 2020, the benefits that the EU can provide as a community for common action are not being fully taken advantage of. Member States have differentiable national targets, to be pursued via individual national action plans. In comparison with the formative years of the European Community, with the European Coal and Steel Community (ECSC) and the European Atomic Energy Community (EURATOM), two of three founding treaties pursued energy-oriented goals – it is clear that today there is a profound lack of determination to use common action in order to force the expansion and use of renewable energy.

Common action in the area of renewable energy could offer a scenario that many Member States could otherwise only dream of. A new "European Community for Renewable Energy" (ERENE) would bring this to fruition. The task of ERENE should be to look beyond the national frameworks to develop and put into practice a Community Strategy designed to facilitate a complete shift to renewable energy for the electricity sector.

The principle aim of ERENE would be to provide the conditions necessary to take full advantage of the EU's climatic, geological and hydrological diversity. While certain EU countries enjoy a much greater economic potential for the production of green electricity than is necessary to cover their own electricity demand, at least one-third of the Member States are in the opposite position. It would be difficult, if not impossible, for them to completely shift to green electricity with a renewable energy strategy focussing solely on the sources within their own borders.

It is clear that a strategy that combines the use of regional renewable sources with a transnational grid for a European internal market for green electricity will create new opportunities both for the sustainable modernisation of the electricity sector and for the eventual coverage of the EU's total electricity demand by renewable energy sources.

ERENE does not aim to compete with the European Commission's January 2008 proposal for the Directive on the promotion of the use of energy from renewable sources. The implementation of this Directive would certainly be a great step forward in the EU's energy policy. Instead, ERENE should offer ambitious Member States the opportunity to develop a strategy that goes beyond the EU Directive through common action, forming an *avant garde* for the shift from electricity production from fossil and nuclear energy to renewable sources. Additionally, it would strengthen European integration and emphasise the value of common action in coping with the challenges of the future.

ERENE could be founded either as a Community for enhanced co-operation between Member States under the aegis of the EU, or as a Community on the basis of a separate treaty. Establishing it as a Community for enhanced co-operation would emphasise that it is a new and relevant integration project for the EU, even if – as with the Economic and Monetary Union – not all Member States would join immediately. Establishing it on the basis of a new separate treaty, such as ECSC and EURATOM, would herald an historic move away from the age of fossil fuels and nuclear power to one of renewable energy. Furthermore, it would demonstrate that the European Union, 50 years after its founding as a Community, remains devoted to the goal of establishing an environmentally friendly and secure energy supply for Europe.

In order to achieve these goals, ERENE's competencies should be as follows:

- To conduct the necessary research, support the dissemination of new technologies and facilitate innovation through the establishment of pilot projects. ERENE should have the possibility to lead common research programmes; establish and run common research institutions; set up demonstration plants for the production and

transmission of energy from renewable sources; and support training programmes, including the promotion of research fellowships and exchange schemes.

- To contribute to the creation of a European electricity grid via participation in the building and maintenance of transnational interconnectors as well as grid connections to demonstration plants, in addition to promoting the development of smart grids for the systemic integration of renewable energy.
- To establish joint undertakings.
- To facilitate and promote investment in renewable energy through a common support scheme for electricity trade from renewable energy. A price-based, technology-specific support scheme for renewable electricity imports in ERENE Member States is proposed alongside the national support schemes.
- To further co-operation with other states in the area of renewable energy.

ERENE's expenditure shall be financed by the participating Member States using the revenue from the European emissions trading scheme. The majority of ERENE's actions shall be financed in accordance with the principle of "geographical return", that is, that the value of projects, investments and electricity-supply agreements are distributed according to individual Member States' financial contributions.

What are the necessary steps to establish a "European Community for Renewable Energy" as the next great European integration project?

- The year 2008 should be used for consultations on the proposal for the creation of ERENE. The UN Climate Conference in Poznan, Poland, in December 2008 is a particularly important date in this context.
- European Parliament elections in the first half of 2009 could provide a platform to bring ERENE onto the European agenda.
- After the Lisbon Treaty comes into force, the ERENE proposal could be put on the European Commission's agenda via the newly created "citizens initiative". The second half of 2009 could then be used to concretise the proposal at the national and European levels, particularly in view of the UN Climate Conference at the end of 2009 in Copenhagen, Denmark.
- In early 2010, the Spanish Presidency could prepare a mandate for establishing ERENE – whether through a separate treaty or as a project of enhanced co-operation in the EU.
- That same year, 60 years after the Schuman Plan, which provided the basis for establishing the first European Community, the ECSC, a decision could then be taken on founding a "European Community for Renewable Energy".

ERENE could, after the creation of the common internal market and the common currency, be a great new project for Europe, accentuating the vital importance of common action for Europe's future.

INTRODUCTION

Climate and energy policy is at the very top of the European Union's political agenda. A sustainable energy policy, the fight against climate change and the security of energy supply are among the key terms characterising today's political debates and action plans. There is a large consensus among the European population that these issues will determine our future to a significant extent.

At the Spring Summit in March 2007, the European Council – once more alarmed by the report of the Intergovernmental Panel on Climate Change (IPCC) as well as the Stern Report – urged and backed by the European Parliament, and following proposals from the European Commission, agreed on the following noteworthy goals: to reduce its greenhouse gas emissions by 20% – or even 30% in the case of an international climate agreement – by 2020, in addition to increasing energy efficiency by 20% as well as achieving a 20% share of renewable energies in total energy consumption during the same period.

The European Commission has, with these targets, introduced an extensive package of proposals – including a draft Directive for the promotion of the use of energy from renewable sources – which was presented on 23 January 2008. It envisions individual targets for Member States as part of a burden-sharing system in order to reach the overall 20% targets for the European Union. If this package of proposals is implemented, EU energy policy will change profoundly in the next decade.

But do the package of proposals and the Renewable Energy Roadmap proposed by the European Commission in January 2007 offer a long-term vision for the future of energy supply in the EU? Does the renewable energy Directive offer European citizens a vision with which they can identify? Does the 20% target and its distribution among the individual Member States make it sufficiently clear to citizens what the EU wants to achieve as a community and that the uniqueness of those targets lies in the fact that they have been decided upon not under the aegis of an international agreement or as a purely national aim, but specifically by the European Union itself? Are the advantages that the European Union offers actually being used to realise a vision, which for individual Member States alone might be pure utopia, but which, through joint efforts, can become reality?

The advantages of the EU are manifold. When it comes to a sustainable energy policy, one of the main advantages is the fact that forces and resources can be pooled together. Others are the common market and the EU's natural diversity: the different geological, climatic and hydrological conditions and the resulting diversity of renewable energy sources in the EU, the surface area of which today encompasses over 35 degrees of latitude and over 40 degrees of longitude – counting Cyprus even more than 45 – and in which approximately 500 million people live. It is these advantages of common action that a European Community for Renewable Energy (ERENE) intends to fully exploit. Seeing the potential of renewable energy sources not just within a national framework but also developing and using it as part of a common strategy

should be the aim of this joint project. ERENE stands for the vision that one of the leading economic regions in the world can take a qualitative step forward towards a modern, sustainable energy policy and increasingly cover its energy consumption with renewable energy sources.

This study does not deal with all sectors of energy consumption, but concentrates primarily on the electricity sector and the corresponding tasks which should be taken on by ERENE as well as the instruments it should have at its disposal. It is in this sector – as the renewable energy-potential analysis clearly demonstrates – that the vision of a complete supply from renewable energies and the end of the dependency on fossil fuels and nuclear energy could be realised the fastest via common action.

The intention of this study is not to be an alternative to the directives proposed by the European Commission in January 2008. It would also be a misunderstanding to see the study as a call to add a few percentage points on top of the 20% target for the share of renewable energies in energy consumption in 2020. The study aims to go much further than that aiming to show the feasibility of the long-term vision of covering the energy demand in the electricity sector increasingly with renewable energy sources.

Of course, as the EU's 20% target enshrined in the draft Directive is a minimum value, each Member State is free to direct its policy towards reaching a higher share of renewable energy in 2020. It is also to be expected that the EU will establish further targets for the period after 2020. However, it cannot be assumed that all Member States will be able to agree on further targets in the near future, nor reach a consensus on replacing fossil fuels and nuclear energy sources in electricity production with renewable energies as soon as possible and joining forces to do so. But what possibilities do EU Member States who wish to use the present schedule have in order to reach this targeted development, not only through national efforts, but also *via* joint action? The creation of ERENE as a community within the EU and an *avant garde* for a sustainable European energy supply shall offer such a possibility.

The present study sets out the circumstances and options for the implementation of such a community. To this end, it describes the diversity of the EU's potential for electricity generation from renewable energy sources and its regional distribution across the EU, and identifies the conditions necessary to make better use of these potentials. The study examines in which areas enhanced joint action could lead to a faster development towards an electricity supply based on renewable energy sources, which instruments ERENE would need to have at its disposal and which legal and institutional form ERENE could be based on.

This study does not develop its own scenario with different steps and degrees of fulfilment of targets at each point in time. Instead, it uses to a great extent findings from different scientific studies, in which scenarios for the use of renewable energy in Europe have been developed. In many aspects it is based on the "vision scenario" of the Öko-Institut in Freiburg, the study on the potential of renewable energies by the German Aerospace Center as well as on papers and studies commissioned and developed by the European Commission.

In addition, this study is embedded in a political context, in which numerous civil society networks for the development of solar energy have been created over the years – EUROSOLAR can be mentioned as an excellent representative example here – as well as parliamentary networks for European initiatives for the development

and use of the renewable energy potential. We would like to make special mention of EUFORES – the European Forum for Renewable Energy Sources – and the inter-parliamentary network EUrenew, the latter of which was created to support the call for a European treaty on renewable energy sources, because the vision concretised in this study is closely related to ideas, demands and proposals from these networks and the people behind them. The vision of a complete electricity supply from renewable energy sources and the end of the dependency on fossil fuels and nuclear energy sources will become a reality sooner and in a more cost-efficient and environmentally friendly way if, at the same time, the other pillars of a sustainable European energy policy, namely energy savings and energy efficiency, are utilised. The proposal for a Community for Renewable Energy would be completely misunderstood if it were thought to be a reflection of political or economic priority being given to the development of renewable energy sources over the above-mentioned pillars of a sustainable energy policy. The increase of energy efficiency and measures for energy savings must also occupy a central position. This, however, should not stop us from seizing the chance to develop a new initiative that offers the possibility of using the natural diversity in the EU to safeguard the climate, increase energy-supply security, modernise the energy supply and bring forth a new integration project.

Following the creation of the single European market and the common currency, ERENE could be a big new project for Europe and clearly demonstrate the importance of joint action for Europe's sustainable future.

1
The Vision of a European Community for Renewable Energy in the Context of the Past, Present and Future of European Integration

1.1 European Energy Communities in the History of the EU: Reasons for Their Establishment, Goals and Instruments

Questions concerning security of energy supply were on the table at the very beginning of European integration. The Schuman plan of 9 May 1950, signed in Paris on 18 April 1951, formed the basis of the Treaty establishing the European Coal and Steel Community (ECSC Treaty). With it, the foundations for the building of the EU had been laid. The reason for the creation of the ECSC was mainly the political view that common management of the coal and steel sectors, which form the basis of the armaments industry, would render any future war between France and Germany materially impossible. But the conviction that joint efforts would help to reach economic targets, including a secure energy supply, faster and better than with national efforts alone was also a driving force behind European integration from the very start.

These reasons also played a decisive role in the creation of the European Atomic Energy Community (EURATOM). The development of nuclear energy was intended to increase energy production and, according to the conviction of the founding members at that time, lead to a reduced dependency on imports for the Community's energy supply. As the costs involved in the development of nuclear energy were considered too high for one country to bear alone, they set out on a joint path. But, here as well, the aspect of joint control of potential war technology, which now had to be used for peaceful purposes, was of great importance. Thus, on 25 March 1957, the EURATOM Treaty, together with the Treaty establishing the European Economic Community (EEC), was signed in Rome (Treaty of Rome) and entered into force on 1 January 1958.

In other words: two of the three treaties on which the EU was founded pursued goals which were in part – or even primarily – related to energy policy. The ECSC Treaty was limited to 50 years and expired on 23 July 2002. The EURATOM Treaty, on the other hand, was signed for an indefinite period of time and continues to exist to this day. Thus, even after the coming into effect of the new Lisbon Treaty, EURATOM will continue to exist side-by-side with the EU as a European community to which all EU Member States belong. Moreover, since the 1965 Merger Treaty, which joined the institutions of all three communities existing at the time, the community institutions are also responsible for EURATOM, although different rules for decision-making were kept.

What responsibilities and aims did or do these European energy policy-related communities have, and what instruments have been put at their disposal in order

for them to carry out these tasks? Such questions are of interest here in light of the possible conclusions that can be drawn for a stronger European promotion of renewable energies, and hence for the creation of – and definition of tasks and competencies for – ERENE (see chapter 3).

The ECSC was responsible for ensuring an orderly coal and steel supply for the common market as well as safeguarding equal access for its Member States and their respective companies to the means of production. Moreover, the ECSC had to supervise the lowering of prices, boost the expansion of the production potential and modernise production itself. In addition, it had responsibilities related to labour and social policy with respect to the workers in the coal and steel sectors. For the fulfilment of its mandate, the ECSC had, among other means, financial instruments at its disposal. This, for instance, allowed it to engage in research activities and to support business investment by making loans and extending guarantees. In addition, it could use instruments of direct market intervention. In the event of a fall in demand for coal and steel, it could set production quotas, and in the case of excessive demand – that is to say during periods of scarcity – it could set up a coal and steel product distribution system. Under certain conditions, it could also fix maximum and minimum prices and had the right to control freight tariffs in order to avoid discrimination.

The ECSC had its own budget and collected its own revenue. To finance the costs of administration as well as the expenditure for subsidies for research and adaptation, the companies producing the coal and steel were charged according to their production value.

As such, the ECSC had some very powerful instruments for intervention and support. The same has applied to EURATOM from then on.

EURATOM's main task – besides the supervision of the use of nuclear fuels within the Community and compliance with common safety regulations – is to promote the development of the nuclear industry. To this end, the Community was granted extensive powers and given a variety of instruments. EURATOM's tasks and competencies include:

- The promotion of research. EURATOM supports research in Member States by granting financial aid, organising joint financing and co-ordinating research in order to avoid part of the work being repeated or dismissed. With the creation of EURATOM, a common research and training programme was decided on. For the execution of this programme, a joint nuclear research centre was created at the supranational level. The personnel needed for this joint research centre was estimated at 1,000 at the moment of its creation. The first common facilities were located in Ispra (Italy). After that, nuclear research centres in Geel (Belgium), Petten (the Netherlands) and Karlsruhe (Germany) followed. The centres, today called Joint Research Centre (JRC), continue to carry out direct measures from the Research and Training Programme regarding nuclear energy in the framework of EURATOM;
- The dissemination of technical know-how. EURATOM has the ability to grant licences for Community rights and, if necessary, to grant licences officially;
- Establishing reporting obligations for investments. In order to facilitate the co-ordination of development and research, illustrative programmes are published;
- The creation of a common market for certain substances and tools. This competency was especially relevant in the period up to the creation of the single European market;

- The common ownership of fissionable material by the Community;
- The creation of a supply agency (today named the European Supply Agency) to secure a supply free from discrimination and to provide equal access to certain raw materials. An obligation to offer these substances to the agency was incorporated into the EURATOM Treaty;
- The setting up of joint undertakings. These enterprises can also have a purely private legal status. EURATOM can participate in these businesses financially. The joint undertakings can be supported through the use of national expropriation procedures for the acquisition of land for the construction of facilities for the nuclear industry, the obtaining of licences, and exemption from taxes and contributions for the establishment of the enterprise and for the acquisition of the land, as well as from those on property and income.

After its creation, EURATOM was allocated its own budget, which was financed by contributions from the Member States. In 1968 this budget was integrated into the overall EEC budget. EURATOM can also enter into loans to support investment in the area of nuclear energy.

The budget figures for the first years of European integration reflect the importance of both energy communities – ECSC and EURATOM – at the time. For instance, in 1965 the EEC budget amounted to 77 million UA (Units of Account), the ECSC budget to 36 million UA and the EURATOM budget to 120 million UA. Thus, 40% of the total budget for the three communities went to EURATOM.

With hindsight, it can be seen that the ECSC truly fulfilled its political function. This, among other things, was to lay the foundations on which peace was to be guaranteed between former enemies through co-operation and the establishment of common supranational institutions. The ECSC was also very important because it benefited economic reconstruction in the member countries via steel production and the energy supply from coal. The negative environmental consequences of the coal mining industry and the use of coal, on the other hand, were regarded as merely local or regional problems and dealt with accordingly for decades. However, from the current perspective, and with a view to the future, it is clear that an energy community based on coal cannot ensure a sustainable energy supply, not only due to the exhaustibility of the resource, but mainly due to the climatic consequences of coal burning.

The second European energy community, EURATOM, also had a strong impact on European integration. From an energy policy point of view, however, with hindsight it must be considered a mistake. The question of the disposal of nuclear waste remains entirely unsolved. Europe depends on the import of uranium, so nuclear technology does not eliminate the dependency problem. But, above all, with the spread of this technology, the safety risks – not only those derived from the individual power plants but also those derived from its dual-use nature, that is, the potential use for the manufacture of nuclear weapons – have grown steadily. It is a technology which can solve neither global climate nor energy problems.

Nevertheless, the EURATOM Treaty remains in force. In this vein, five Member States – Germany, Ireland, Hungary, Austria and Sweden – have expressed their view in a declaration on the Lisbon Treaty (Declaration No. 44) that the provisions of the EURATOM Treaty since their entering into force have not been substantially changed

and need to be updated, and that they therefore support the idea of an Intergovernmental Conference on the modification of this treaty, which they say should be convened as soon as possible. However, it is still unclear whether it will come to such an Intergovernmental Conference in the near future, and, if so, with what aim. Regardless of such an Intergovernmental Conference, under the new revised provisions of the Lisbon Treaty, the government of any Member State, the European Parliament or the European Commission can present proposals for the modification of the Treaty on European Union (TEU) and the Treaty on the Functioning of the EU (formerly EC Treaty (Art. 23 TEU)). Although the EURATOM Treaty is not included in this revision clause, in theory each of the mentioned actors can present a proposal to include the safety provisions of the EURATOM Treaty in the Treaty on the Functioning of the EU and to abandon the provisions regarding the promotion of the nuclear industry. However, to bring such a proposal for the cancellation of the EURATOM Treaty into force, consensus and ratification in all Member States is needed.

ECSC and EURATOM demonstrate the determination of the Member States in the founding years of the European Community to achieve a secure and independent energy supply through joint efforts. The promotion of renewable energy, on the other hand, is only explicitly included in the responsibilities of the EU with the Lisbon Treaty. Today, we know that it is impossible to obtain a sustainable energy system either on the basis of fossil energy sources alone, or through nuclear power, and that renewable energy plays a key role in securing a sustainable energy system. Nevertheless, a fierce determination at the European level – as was present with the ECSC and EURATOM – to stimulate the expansion of the use of renewable energies via joint action is still missing.

Thus, establishing a European Community for Renewable Energy has – in addition to the aim of moving away from the fossil and nuclear era and entering into an era of renewable energy – the strong symbolic-political value that the European Community, more than 50 years after its creation, is again dedicating itself with renewed common efforts to a goal that it has until now not achieved: to bring about an environmentally friendly and safe energy supply in Europe.

1.2 Today's Climate and Energy Challenges for the EU

The challenges facing the EU in relation to its energy policy have become increasingly complex and urgent. The Member States are therefore more and more prepared to accept a common European energy strategy. Although with the ECSC and EURATOM two special communities were created for coal and nuclear energy, questions related to energy policy *per se* were not considered issues of common interest for many years. It was only with the first steps towards the liberalisation of the electricity and natural gas sectors, the new concern about security of supply and, especially, the threat of climate change that this has changed.

Today, it is clear that climate and energy policy are two sides of the same coin. In the industrialised and in the emerging countries, the energy sector is responsible for most of the greenhouse gas emissions – 70% of the climate-damaging CO_2 emissions are generated by the production and use of energy. During the past 650,000 years, greenhouse gas concentrations in the atmosphere were never as high as they are today.

Currently, the EU is responsible for one-sixth of all CO_2 emissions worldwide and one-fifth of all greenhouse gases from industrialised countries. In 2005, the total greenhouse gas emissions of the EU-27 amounted to 5,177 Mt CO_2 equivalent. In comparison with the reference year, 1990, this represents a 7.9% reduction. However, for the EU-15, the reduction is only 2%. The Kyoto target for the EU-15 of an 8% reduction for the first period, 2008–2012, can now only be reached if all available mechanisms for the reduction of greenhouse gases – including lowering carbon emissions and so-called flexible mechanisms – are used. If no additional measures for the reduction of greenhouse gases were to be taken until 2020, emissions in the EU in the year 2012 would be only 6% below those of the reference year, 1990. At the same time, energy consumption, and hence greenhouse gas emissions, is increasing steadily in large emerging countries such as China, India, Brazil and South Africa as a result of their fast economic growth. If no countermeasures are taken, global energy consumption will go up by roughly 70% over the next two decades, leading to a further rapid increase in CO_2 concentrations in the earth's atmosphere.

Rising CO_2 concentrations not only raise the average temperature of the earth, but at some point they also trigger other catastrophic effects. Hence, the aim of the EU is to limit global warming to a maximum of 2°C above the pre-industrial value, as once this threshold value is exceeded, there might be irreversible and possibly disastrous changes. At present, the EU is keen to oblige all industrialised countries to lower greenhouse gas emissions. As such, the EU imposed the obligation on itself to reduce greenhouse gas emissions by 20% by 2020. If the other industrialised countries participate, the reduction target will be raised to 30%. Furthermore, the European Council said at its March 2007 summit that the industrialised countries should focus on the target of jointly reducing emissions by 60–80% by 2050 compared to 1990.

Global energy consumption will continue to increase. According to the latest forecast of the International Energy Agency (IEA) ("World Energy Outlook 2007"), global energy consumption in the year 2030 will be 55% higher than it is today. The Energy Information Administration (EIA) of the US Department of Energy reaches a similar conclusion in its reference case, with a 57% increase by 2030. According to an estimate by Shell, global energy consumption could even triple by 2050. The main factors contributing to this increase are said to be the increase in the world population – from the current ~6 billion people today to ~10 billion people by 2050 – and the clearing of the economic backlog by emerging and developing countries, with 70% of the additional energy consumption attributable to countries outside the Organisation for Economic Co-operation and Development. In the developing countries, the per capita consumption of the growing population will continue to increase in parallel with their economic development, while industrialised countries could balance their increase in energy demand due to economic growth by saving energy and enhancing energy efficiency.

The increase in the world population, worldwide economic growth and rising prosperity in industrialised and developing countries and the resulting higher energy consumption, on the one hand, and the limited fossil resources together with the environmental consequences of the use of these energy sources for the global climate, on the other, lead to key questions regarding the world's future: How can energy and resources be used sparingly and efficiently? And how can scarce resources be distrib-

uted so that economic development becomes possible for a larger number of people without further damaging the environment?

The rising global energy demand, the competition for fossil energy, the regional concentration of part of these resources in politically unstable countries, and the experience that the presence of gas and oil is synonymous with potential geopolitical power have not only raised concerns regarding energy-supply security among EU political actors, but also among the population in general.

Some 52% of the EU-27's energy supply is covered by imports. According to "business-as-usual" scenarios, the EU's import dependency will reach 65% by 2030. According to information provided by the Öko-Institut, the dependency ratio is already at ~60% if – unlike in most statistics – one does not regard nuclear electricity production as 100% national, but takes into account that only approximately 2% of the uranium used in the EU actually comes from EU mines. Based on this calculation, the EU's dependency on imports for its energy supply would even rise to over 70% over the next two decades.

When comparing the individual EU Member States, import dependency varies strongly (see Appendix 1). Cyprus, for instance, was completely dependent on imports in 2005. Its own energy production – from renewable energy sources – was limited to 4% of its total consumption in 2005. At the other end of the spectrum is Denmark, which is currently the only net exporter of energy sources in the EU.

As a result of the regional concentration of resources, the high costs involved in the building of pipelines and also political reasons, there are only very few third countries covering the EU's energy import demand. In the case of natural gas, for example, half of the EU's imports are covered by only three countries (Russia, Norway, Algeria), while for nuclear fuels, the EURATOM Supply Agency states in its 2006 annual report that: "[d]ue to a low number of major players at the various stages of the fuel cycle, supply constraints can happen at any stage."

Various developments in the energy markets have led to sharp price increases. When oil prices (and linked to them gas prices) – after a dramatic fall to the "historic" value of 9.50 USD per barrel (195 litres) in 1998 – started rising again, it was an expected development for volatile energy prices. But the price continued to increase. In the year 2000, the oil price had already more than tripled, and in 2002 the next dramatic price increase occurred, with the barrel price reaching 78.40 USD in July 2006 and crossing the 100 USD threshold in January 2008.

This increase in oil prices has been the result of a number of short- and long-term factors. In the United States, oil refineries saw up to one-third of their capacity disappear as a result of retrofitting for environmental reasons, and US oil companies therefore started buying up mineral oil products worldwide. The demand from emerging countries such as China and India is growing considerably and conflicts (or crises) and natural disasters (e.g., Hurricane Katrina) have also caused production losses. Moreover, energy markets are also stimulated by speculation from diverse financial players who have switched from the battered credit market to the booming raw materials and currency markets. For consumers, the soaring global energy prices represent a new inflation risk. Those most affected by this development are the world's poorest.

But the current climate and energy challenges affect many other aspects of individual and society life. The report of the second working group of the IPCC

described the effects of climate change on living conditions, including economic consequences for each continent. Climate change raises new questions about justice, both between North and South and within each society. A further reduction in available food due to climate factors will affect the least developed countries (LDCs) most. At present, one-fifth of the world's population lives in coastal areas, so the imminent loss of living space as a result of rising sea levels will lead to huge flows of refugees.

Climate change also raises new questions regarding international security. The potential for resource-related conflicts is increasing. The expansion of the use of nuclear energy for the production of electricity could lead to new risks of proliferation in the face of the already volatile non-proliferation regime. The proliferation risk of nuclear technology, which can be used for military purposes by "civil" nuclear energy programmes, exists mainly in politically unstable countries. These are a few of the problems which the EU High Representative for Common Foreign and Security Policy, Javier Solana, and the European Commission list in their joint paper "Climate Change and International Security" published in March 2008. The paper concludes that the effects of climate change on international security are not a future problem, but one which can already be felt today and will require our long-term attention. It is therefore high time that Europe starts using all its power and potential to find answers to these challenges.

1.3 The Contribution of a New European Community for Renewable Energy to a Sustainable European Energy System

A sustainable energy system has to find answers to the challenges of climate change and to the global economic and social questions around energy supply. In 2006 the Öko-Institut carried out a scenario analysis of a sustainable European climate and energy policy for the Greens and the European Free Alliance in the European Parliament. The vision scenario developed in the study is based on two main tenets:

1. By 2020, compared to the reference year, 1990, emissions in the EU should decrease by 30% if all non-controversial options for the reduction of greenhouse gases are implemented.
2. As a result of the nuclear "phasing-out" policy of different EU Member States and the technical limitation of the 40-year lifecycle of nuclear power plants, such plants should disappear, and no new ones should be built.

According to the vision scenario, all greenhouse gas emissions in the EU could be reduced 31% by 2020 and 40% by 2030. CO_2 accounts for the biggest emission reduction. According to individual sectors, the vision scenario mentions the following emission reductions:

- In the electricity sector – the main source of CO_2 emissions in the EU – a total reduction of 36% can be achieved by 2030 via measures such as combined heat and power (CHP), the switch from coal to gas, and the use of renewable energy sources as well as a more efficient use of electricity in other sectors.
- The transport sector – including air transport – can contribute with a reduction in greenhouse gases of up to around 20% by 2030.
- Private homes can achieve a total greenhouse gas reduction of 15.5%.

- In the case of non-CO_2 greenhouse gases, different measures can lead to a 14% reduction by 2030.
- Greenhouse gas emissions can be reduced by 8% in the production sector and 7% in the services sector. If carbon capture and storage power plants were feasible on a large scale from 2020 onwards, the emission reduction could be another 100 million tonnes of CO_2 higher by 2030, or 5% of total emission reductions.

The most significant individual contribution comes from renewable energy sources: 24% of emission reductions is attributable to these energy sources. The increased use of CHP, and the fuel switch for electricity production account for an 11% reduction by 2030, a more sparing use of electricity for 12%, more efficient heating and cooling for 21%, and the measures taken in the transport sector for 17% of total emission reductions.

According to the Öko-Institut's vision scenario, the share of renewable energies in electricity production in the EU in 2020 will be around 44% and rise to 59% by 2030, while in the business-as-usual scenario it is only 26%. On one hand, the higher share in the vision scenario is a result of the assumption that electricity consumption rises more slowly than in the comparative scenario due to energy savings and increased efficiency, and on the other because it is based on a greater use of renewable energy sources.

This clearly shows that a sustainable climate and energy policy should be based on the three pillars: energy savings, energy efficiency and renewable energies. An efficiency and savings strategy alone is not a sufficient answer to the challenges, both at the European level and globally. An increased use of renewable energy sources is necessary as well. Conversely, a strategy aimed at an increase in the energy supply from renewable energies alone is not enough to achieve an energy system that fulfils the criteria of sustainability.

The decisions of the European Council and the proposals the European Commission presented in January 2008 rightly establish a close connection between climate and energy policy. They are based on the twin strategy of improving energy efficiency and increasing the use of renewable energy sources. In view of the urgency of the tasks, this strategy requires a dramatic increase in energy efficiency and the replacement of fossil and nuclear energy sources with renewables. Both strategies also counteract an increased dependency of the EU on energy imports.

As such, the EU has set itself the goal to increase its energy efficiency 20% by the year 2020. This goal can only be reached with a package of measures in all sectors, with the biggest savings potential in the construction sector. In energy production, almost half of the primary energy used can be saved via CHP. In the transport sector, the significant efficiency potential can only be realised in a short period of time if consumption is reduced in all market sectors. Comprehensive measures are also necessary in the industry and in the area of consumer goods. Here, following the Japanese example, a European "top-runner programme" based on the Eco-Design Directive can ensure that the most efficient technologies penetrate the market the fastest.

Important recent steps taken by the EU with a view to increasing energy efficiency and reducing energy consumption included the approval of the Eco-Design Directive for Energy-using Products 2005, the Directive on Energy Efficiency and Energy

Services, and especially the approval of the Action Plan for the increase of energy efficiency in the year 2006. In 2007, the proposal for a regulation on new emission standards for passenger cars was presented, and it is vital that the initiatives the Commission has announced for 2008 and 2009 – including the amendment of the Directive on total energy efficiency of buildings – are adopted and implemented urgently in order to reach the 20% efficiency target.

The most important instrument of the EU to reduce CO_2 emissions, however, is the European Emissions Trading Scheme (EU ETS), where the Commission has already put forth a reform proposal into the legislative process within the framework of its Energy and Climate Package.

In January 2007, the EU Commission proposed the "Energy and Climate Change Package" for an enhanced use of renewable energy sources and outlined a related "roadmap". On this basis, the European Council agreed in March 2007 for the first time on legally binding targets for the use of renewable energy. By 2020 the share of renewable energy should be increased to 20% of total EU energy consumption. This means a 150% increase in comparison with the current situation.

The draft Directive on the promotion of the use of energy from renewable sources launched by the European Commission on 23 January 2008 should implement the aforementioned 20% target. To this end, differentiated national targets have been defined for each Member State as part of a "target-sharing" strategy (table 1). These are calculated on the basis of a "fair and adequate" distribution that takes into account the different national situations and economic possibilities, plus a fixed increase of that share, which is the same for all countries. These national target values become binding as a result of the Directive. Each Member State has to draw up national action plans which should ensure that both the final and interim targets are met. The European Commission will be in charge of supervising these plans.

The proposal for the Directive does not contain any sector-specific targets for electricity, heating and cooling. According to the subsidiarity principle, the Member States should be responsible for deciding in which areas they want to promote the use of renewable energy sources in order to reach the overall national target. For reasons of the internal market, the draft Directive does propose a common sector-specific target for the fuel sector, according to which the share of biofuels should reach 10%. However, this provision is attracting criticism due to the possible consequences for food production and its ecological effects, although the draft Directive contains strict provisions on production conditions.

As a result of the Directive for the promotion of electricity produced from renewable energy sources, which has been in force since 2001, there is a European target for the electricity sector, according to which 21% of the electricity production should stem from renewable energy sources by 2010. However, the targets for the individual EU-15 Member States contained in this Directive and the target values for the new Member States – which were incorporated into the accession treaties – are only indicative, not legally binding. Based on the current situation, the share of renewable energy in electricity production in the year 2010 for the whole EU-25 could be only 19%, with very different contributions from the individual Member States. Nine countries are on the way to reaching their national targets (Denmark, Germany, Hungary, Finland, Ireland, Luxembourg, Spain, Sweden and the Netherlands). However, 16 countries are still lagging behind.

Table 1: National targets for the share of renewable energy in final energy consumption in 2020

Member State	Share of renewable energy in final energy consumption	Binding target value for 2020	Increase of
Sweden	39.8%	49.0%	8.2%
Latvia	34.9%	42.0%	7.0%
Finland	28.5%	38.0%	9.5%
Austria	23.3%	34.0%	10.7%
Portugal	20.5%	31.0%	10.5%
Denmark	17.0%	30.0%	13.0%
Estonia	18.0%	25.0%	7.0%
Slovenia	16.0%	25.0%	9.0%
Romania	17.8%	24.0%	6.2%
France	10.3%	23.0%	12.7%
Lithuania	15.0%	23.0%	8.0%
Spain	8.7%	20.0%	11.3%
EU	8.3%	20.0%	11.7%
Germany	5.8%	18.0%	12.2%
Greece	6.9%	18.0%	11.1%
Italy	5.2%	17.0%	11.8%
Bulgaria	9.4%	16.0%	6.6%
Ireland	3.1%	16.0%	12.9%
Poland	7.2%	15.0%	7.8%
Great Britain	1.3%	15.0%	13.7%
Netherlands	2.4%	14.0%	11.6%
Slovak Republic	6.7%	14.0%	7.3%
Belgium	2.2%	13.0%	10.8%
Czech Republic	6.1%	13.0%	6.9%
Hungary	4.3%	13.0%	8.7%
Cyprus	2.9%	13.0%	10.1%
Luxembourg	0.9%	11.0%	10.1%
Malta	0.0%	10.0%	10.0%

Source: EU Commission 2008

On the whole, it can be said that there is basically a consensus within the EU on the key role played by renewable energy in a sustainable energy strategy. They contribute to climate protection, they reduce the EU's dependency on energy imports as they are domestic energy sources, consequently increasing the security of the supply. Economically speaking, they offer various advantages such as reducing dependency on volatile oil, gas and uranium prices, which have risen sharply in recent years. The technological development in this up-and-coming industry enhances the EU's competitiveness. Even now, this economic sector already provides employment for 350,000 people inside the European Union.

For these reasons, it is highly significant that the EU Member States already agreed in March 2007 to increase the share of renewable energies in total energy consumption at least 20% by 2020, and it is to be welcomed that there is also agreement on the fact

that the new Directive on Renewable Energy should be approved by the Council and the European Parliament (EP) at least by the beginning of 2009.

Nevertheless, we should already start looking further than 2020. The replacement of coal or nuclear power plants with facilities using renewable energies will take several decades, and decisions in the energy sector on investments worth billions of euros are to be taken in the coming years. Due to the long operating life of energy plants – for power plants this is 40 years on average – the investment decisions of the coming years will set the course for the energy supply-structure until the middle of the 21st century. Therefore, we should not only focus on achieving the targets for the year 2020, but it would also be desirable to have a broader European vision for the use of renewable energy sources, and to work on the realisation of that vision.

The binding targets for each Member State contained in the Directive are minimum targets for the year 2020. Today, it is hard to predict whether and when these individual targets, which are to be achieved via National Action Plans (NAP), will be updated. In any case, it is not the aim of this study to propose other targets for the NAPs, nor propose that higher target values are already determined today for the next decade.

It is rather about the contribution of the European dimension itself. What vision does the EU have for the use of its domestic and diverse renewable energy sources? What could that vision look like? What measures can we take as a community, at the supranational level, in order to realise that vision? Given the significance of renewable energies, there should be an action plan at the European level as well, aimed at a steady increase in the use of domestic renewable energy sources in order to ensure the Community's energy supply, while at the same time protecting the climate and enhancing the EU's competitiveness. The proposal to create a European Community for Renewable Energy represents such a European action plan.

Just as the Member States dedicated themselves with great determination to a common energy policy strategy with the establishment of the ECSC and EURATOM, it is now time to develop and implement, with the same determination, a vision for Europe for the use of its domestic renewable energy sources. This should be the task of a European Community for Renewable Energy (ERENE).

The creation of a Community for Renewable Energy would reinforce one of the pillars of the strategy for a sustainable energy policy. This should not be understood as a prioritisation to the detriment of the other pillars – energy savings and energy efficiency – but as a concretisation of one pillar: the renewable energy pillar.

This concretisation is focussed on the electricity sector. ERENE should pursue the goal of replacing fossil and nuclear energy sources in electricity production with renewable energies as soon as possible. Once again, it should be emphasised that the focus on the electricity sector does not imply an underestimation of the other sectors of energy consumption. But for the transport sector, with a change in modal split and a radical improvement of efficiency in the automobile industry, different concrete steps need to be taken in order to provide an answer to climate and energy challenges. Also, the question of the role renewable energies could and should play in the transport sector requires different research and political answers than in the case of electricity production. This also applies to the heating and cooling sector. The package of tasks proposed here for ERENE should therefore not be understood as an exclusion of certain sectors but rather as a concretisation of one specific sector.

The creation of ERENE would constitute an important step forward in a strategy for a sustainable European energy policy. With ERENE the possibilities and advantages of common action at the European level can be used in order to make better use of the great variety of the European renewable energy potential. The aim of ERENE is to realise the vision of increasingly – and ultimately entirely – covering the EU's electricity needs with renewable energy sources. ERENE would reinforce European integration and show its value for coping with the tasks of the future.

2
The Potential for Green Electricity within the EU

Which renewable energy sources are available in the EU? What are their potentials? How are those potentials distributed across the different regions of the EU? Is ERENE's target of increasingly covering Europe's electricity demands with power produced from renewable sources a quixotic utopia or a vision that can be realised? What share of that potential is being used today, and what obstacles hinder further development?

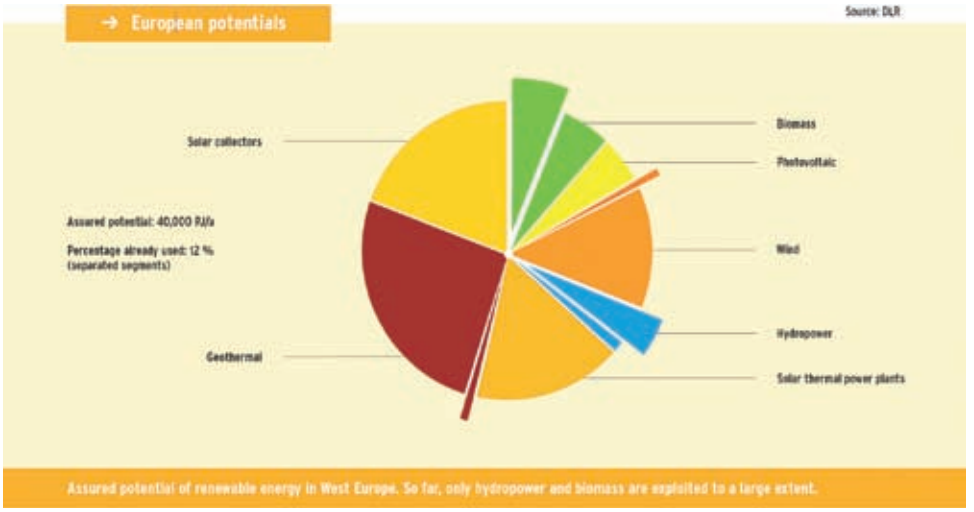
To answer these questions, this study is primarily based on the results of two studies: the German Aerospace Center's TRANS-CSP study, which was commissioned by the German government, and the international GreenNet EU-27 study project, conducted by the Technical University of Vienna at the request of the European Commission, the results of which were incorporated in its Technology Map.

2.1 EU Renewable Energy Potentials and their Regional Distribution

Thanks to its geological, climatic and hydrological conditions and diversity, Europe is in a very good position to obtain a balanced energy supply based on renewable energy. Renewable energy technologies – hydropower, wind energy, solar thermal energy, photovoltaics, geothermal power, wave and tidal power, and biomass energy – can all be developed and used on the European continent, although not in all countries or regions.

When considering the potential for renewable energy sources, a distinction must be made between theoretical, technical and economic potentials. The theoretical potential refers to the maximum amount of physical energy resources available, while the technical potential is a reduced amount because the given or assumed advance of technology in the timeframe in question and structural and ecological restrictions on exploitation and use are taken into account. The economic potential involves a further restriction and encompasses only the share of the technical potential which is economically competitive according to certain assumptions and excludes the share which is used by competing sectors. The technical potential of renewable energy available in the EU, the Candidate States, the EEA and Switzerland together is generally estimated at 40,000 PJ/a (petajoules per annum). This figure represents approximately 60% of the EU's current primary energy consumption (BMU 2006: 26; DLR 2006). However, only around 12% is actually being used. Only the hydropower potential has been extensively exploited, with a use of 80% (BMU 2006: 26). For biomass around 50% of the estimated potential is being used (see Fig. 1).

Fig. 1: Technical potential for renewable energy in Europe (see country list table 1) and shares currently used

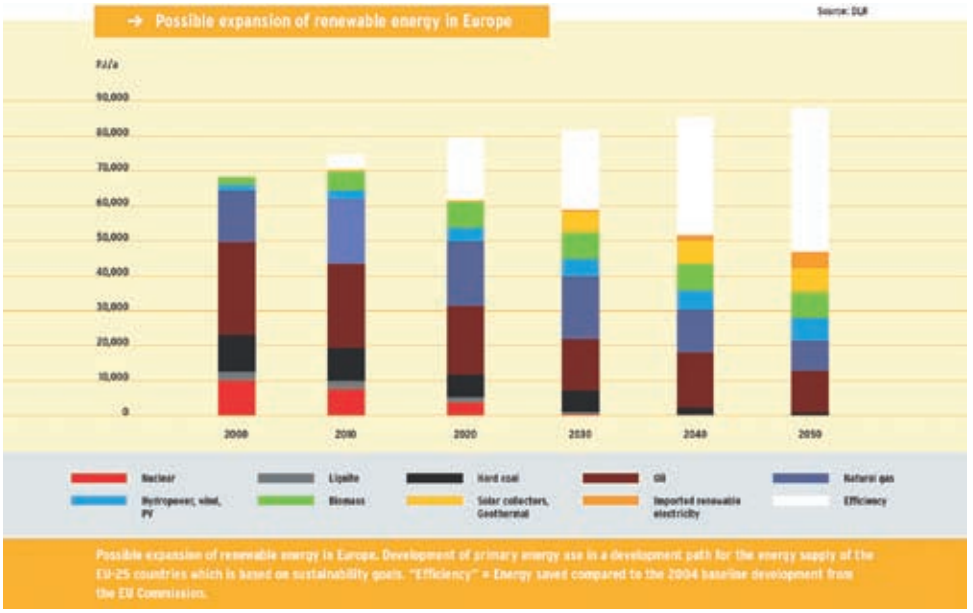


Source: BMU 2006: 26; Basis of data: DLR 2006

From a long-term perspective, there are additional large-scale potentials, namely the further expansion of offshore wind and geothermal energy and also the import of solar power from non-European countries in the sunbelt region around the Mediterranean Sea. There is no doubt that Europe has the potential to direct its energy mix increasingly towards renewable energy sources. To what degree Europe will make use of this potential in the future depends on a variety of factors, about which different assumptions are made in different scenarios. One scenario for the increased use of this potential in the framework of a sustainability strategy is shown in Fig. 2. According to this scenario, half of the primary energy consumption in Europe could come from renewable sources by the year 2050.

If one looks specifically at the electricity sector, the analyses show that Europe has the potential, in the long-term, to increasingly – and finally, completely – switch to renewable sources for its electricity supply. The study from the German Aerospace Center states that the EU, the EEA Member States, Switzerland, the Candidate States Croatia and Turkey and the states in the western Balkan countries together have an economic potential for regenerative power of around 5,780 TWh/a (Terawatt hours per year). The current electricity consumption of the EU-27 is around 3,310 TWh/a (2005), and for 2050 the German Aerospace Centre's estimate of the demand for all countries involved amounts to 4,000 TWh/a. The sum of the energy potentials for the production of green power in Europe is thus considerably higher than the current and the estimated future demand.

Fig. 2: Possible expansion of renewable energy in Europe



Source: BMU 2006: 49

However, the potential for power generation from renewable energy sources are evidently not distributed uniformly across all regions. As a result of different climatic, hydrological and geological conditions, the various renewable energy sources have different geographical distribution patterns. On the "country maps" taken from the German Aerospace Centre study (Fig. 3), these regional clusters or regional concentrations for renewable energy sources are clearly visible.

Fig. 3: Regional distribution of the potentials for the production of electricity from renewable energy sources

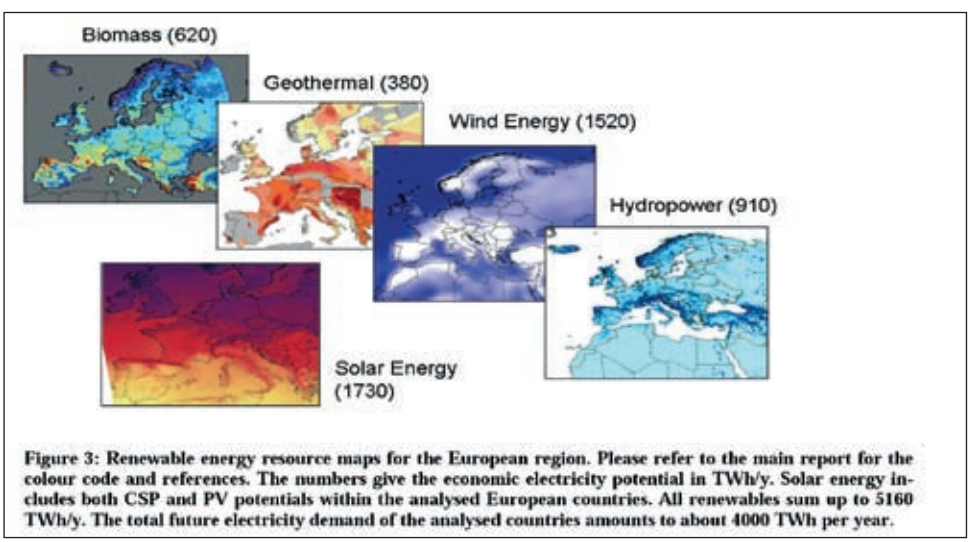


Figure 3: Renewable energy resource maps for the European region. Please refer to the main report for the colour code and references. The numbers give the economic electricity potential in TWh/y. Solar energy includes both CSP and PV potentials within the analysed European countries. All renewables sum up to 5160 TWh/y. The total future electricity demand of the analysed countries amounts to about 4000 TWh per year.

Source: DLR 2006: 5; the more intense the colour in a tone, the greater the potential

The maps show that the potential for hydropower is the highest in Scandinavia and the central Alpine countries. The solar energy potential is concentrated in the Mediterranean countries. A large part of the geothermal potential can be found in south-east Europe. Great Britain and Ireland and the Atlantic coast have high wind energy potential, and the biomass potential is abundant in the north and the north-east of Europe.

On the other hand, the maps also show that in most regions in Europe there is a mix of renewable energy potentials. Therefore, a strategy for the development of renewable energies in Europe cannot focus solely on the exploitation of the geographically concentrated sources through a pan-European grid. Such a strategy would neither be quantitatively sufficient, nor would it take advantage of the decentralised supply of renewable energy. Conversely, a strategy which is based exclusively on the use of the renewable energy sources available in a given region – especially if "regional" is not defined according to natural conditions but according to political-administrative borders – will hamper the switch to renewable energies and, at the same time, leave high potentials in other regions – especially in certain regional clusters – unexploited.

The variety of available types of renewable energy in the different European countries and the regional clusters for the different renewable energy sources are shown in table 2, which lists the economic potential for regenerative electricity from each individual source by country.

The following graphs clearly illustrate the different geographical distributions of the potential for electricity production from hydropower, wind energy, geothermal energy, biomass, concentrated solar power plants, photovoltaics and wave and tidal power. In these graphs the countries are listed in a regional order, and the shares corresponding to the EU on the one hand and to countries which are not (yet) EU members on the other hand can be easily seen.

The potential for electricity generation from concentrated solar power plants, geothermal energy and from wave and tidal power display a particular geographical concentration, while potentials for electricity generation from wind energy, photovoltaics and biomass are spread more evenly across the EU.

Table 2: Long-term economic potential for renewable energy in the EU, Norway, Iceland, Switzerland, Candidate States and western Balkans (in TWh)

	Hydro	Geo	Biomass	Solar	Wind	Photo-voltaic	Wave and tidal	Total
Belgium	0.5	no entry	7.3	no entry	13.0	2.1	0.2	23.2
Bulgaria	12.0	0.8	7.7	no entry	8.9	2.0	no entry	31.4
Czech Republic	3.0	no entry	20	no entry	5.8	1.1	no entry	29.9
Denmark	0.0	no entry	6.6	no entry	55.0	1.3	2.2	65.1
Germany	26.0	28.2	87	no entry	262.0	23.4	7.0	433.6
Estonia	0.4	no entry	10.5	no entry	3.0	no entry	no entry	13.9
Ireland	1.3	no entry	6.2	no entry	55.0	1.1	4.0	67.9
Greece	12.0	9.4	7.2	4	49.0	3.9	4.0	89.5
Spain	41.0	28.2	40.4	1278	93.0	19.5	13.0	1531.1
France	72.0	14.1	79.1	no entry	129.0	23.4	12.0	329.7
Italy	65.0	19.6	46.1	7	79.0	17.6	3.0	237.2
Cyprus	1.0	no entry	0.6	20	6.0	0.1	0.2	27.9
Latvia	4.0	no entry	4.6	no entry	1.3	no entry	no entry	8.6
Lithuania	1.5	0.8	12.5	no entry	0.9	no entry	no entry	15.7
Luxembourg	1.0	no entry	0.4	no entry	0.0	0.8	no entry	2.2
Hungary	4.0	51.9	11.3	no entry	1.3	2.0	no entry	70.5
Malta	no entry	no entry	0.1	2	0.2	0.1	0.1	2.3
Netherlands	0.1	1.3	9.6	no entry	40.0	4.3	1.0	56.3
Austria	56.0	4.1	30.6	no entry	3.0	2.9	--¬	96.6
Poland	7.0	1.7	52.1	no entry	65.0	3.1	1.0	129.9
Portugal	20.0	14.1	15.2	142	18.0	3.9	7.0	220.1
Romania	18.0	1	40.9	no entry	7.9	2.0	no entry	69.8
Slovenia	8.0	0.4	6.3	no entry	0.3	1.0	no entry	16.0
Slovakia	6.0	3.1	10.7	no entry	0.7	2.0	no entry	22.5
Finland	20.0	no entry	53.7	no entry	27.0	1.7	2.0	104.4
Sweden	90.0	1.3	80.4	no entry	63.5	3.7	2.0	240.9
United Kingdom	8.0	0.3	30.7	no entry	344.0	7.8	60.0	450.8
EU Countries	477.8	180.3	677.8	1453.0	1331.8	130.8	118.7	4370.2
Switzerland	38.3	no entry	8.0	no entry	0.0	3.7	no entry	50.0
Turkey	122.0	300.1	44.7	131	110.0	15.6	no entry	723.4
Macedonia	4.0	no entry	2.6	no entry	0.1	0.6	no entry	7.3
Croatia	8.0	1.1	8.9	no entry	2.6	0.8	3.0	24.4
Serbia & Montenegro	27.0	4.1	14.3	no entry	0.3	1.0	2.0	48.7
Bosnia-Herzegovina	19.0	no entry	9.5	no entry	0.1	0.6	no entry	29.2
Iceland	40.0	182.4	0.1	no entry	1.0	0.3	10.0	233.8
Norway	178.0	no entry	25.8	no entry	76.0	1.0	10.0	290.7
Total	914.1	668.0	791.7	1584.0	1521.9	154.4	143.7	5777.8

Source: Representation according to DLR 2006: 43, as well as EBRD 2005.

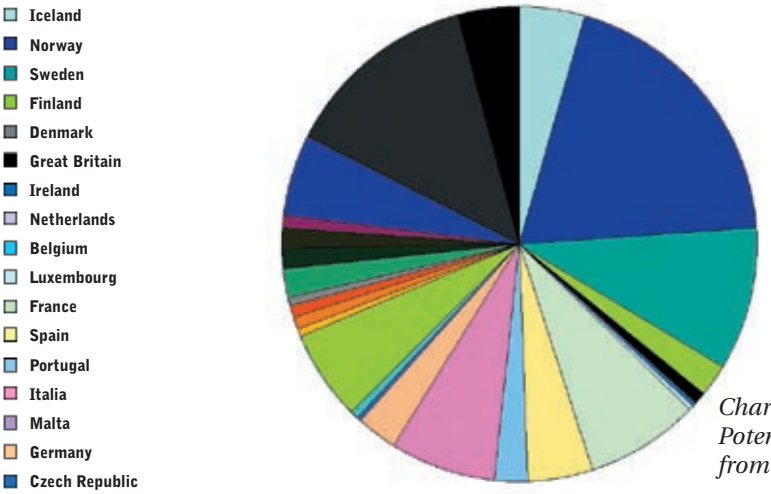


Chart 1
Potential of electricity from hydropower

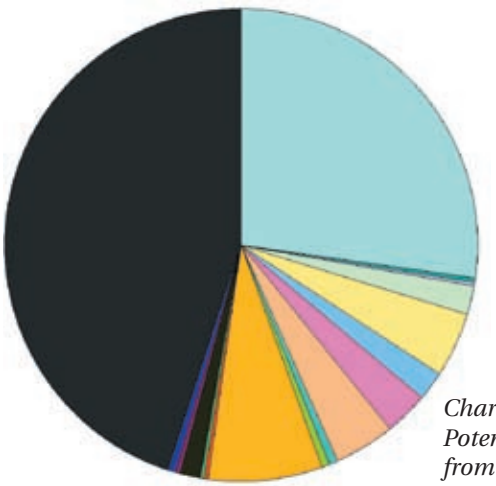


Chart 2
Potential of electricity from geothermal

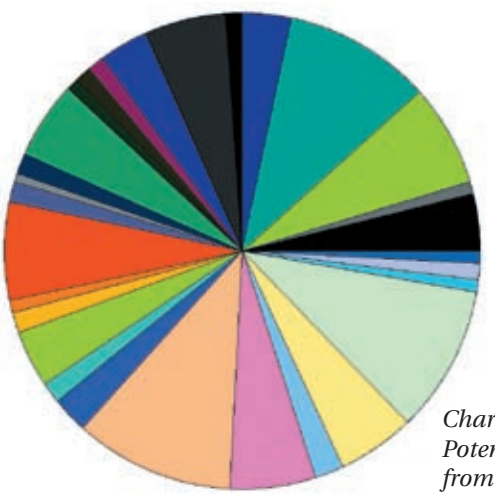


Chart 3
Potential of electricity from biomass

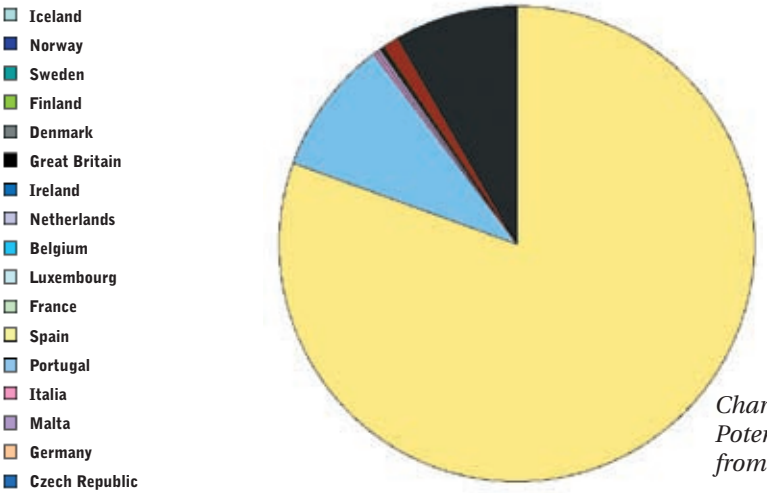


Chart 4
Potential of electricity from concentrated solar

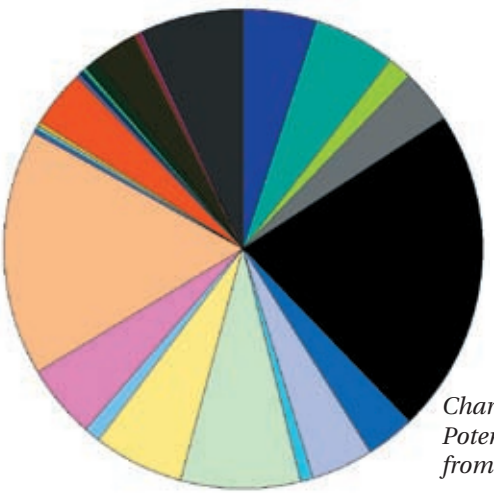


Chart 5
Potential of electricity from wind power

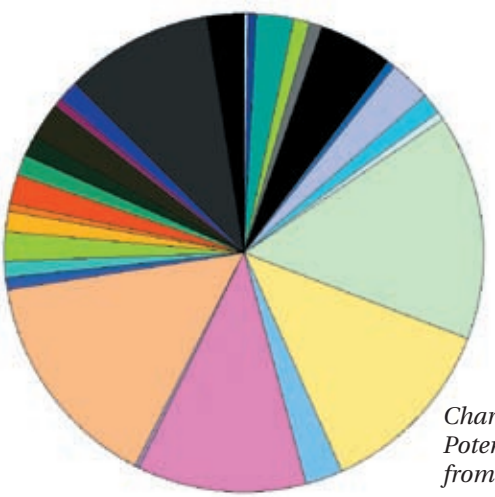


Chart 6
Potentials of electricity from photovoltaic

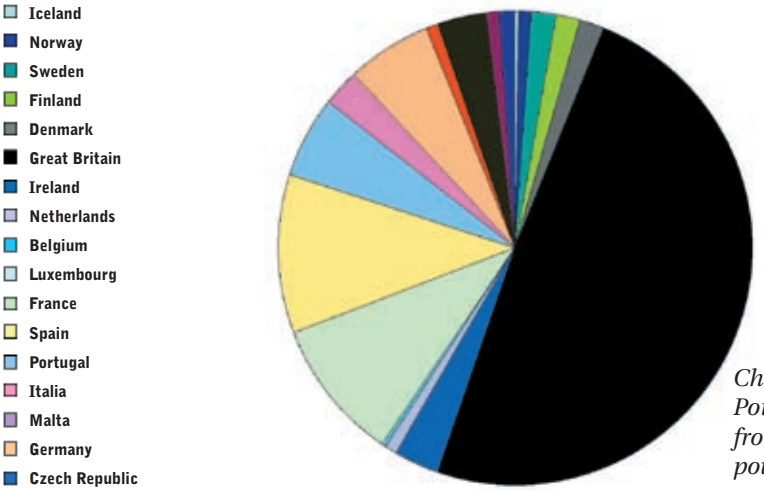


Chart 7
Potential of electricity from wave and tidal power

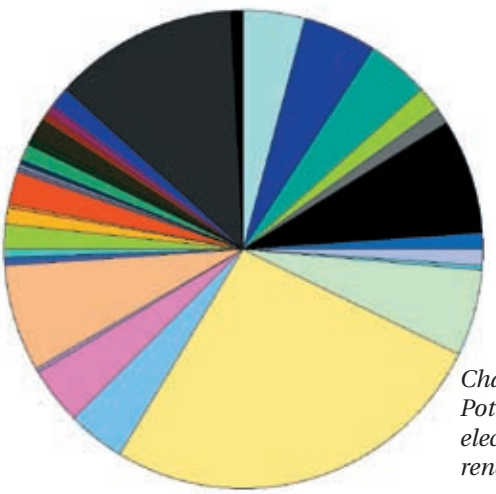


Chart 8
Potential for total electricity from renewable energy

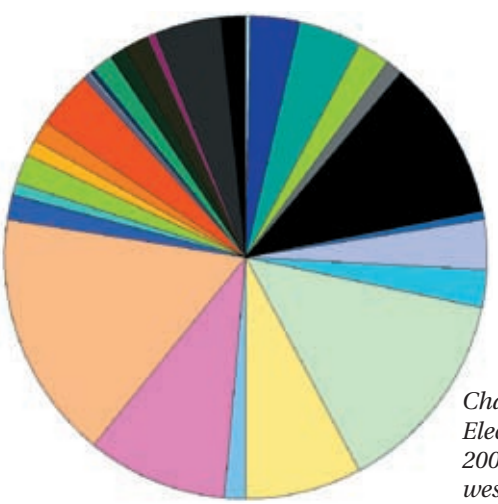


Chart 9
Electricity consumption 2005 (excluding the western Balkans)

When comparing charts 8 and 9, it can be seen that the potential for green electricity is distributed in such a way across the countries that some countries have surplus potential while others, according to current estimates, have a national economic potential of renewable energy that is insufficient to cover their entire electricity demand.

The fluctuating availability of renewables over the course of a day or year plays an important role for a strategy aiming to base electricity production increasingly on renewable energy sources. Electricity generation from wind energy and photovoltaics is subject to stronger fluctuations than electricity production from biomass, hydropower or geothermal power, for example, which can be produced on demand. For electricity generation by concentrated solar power plants, a consistent supply security is also assumed, depending on the location of the plant, storage technology and the possibility of hybrid production in combination with gas. For a consistent capacity on demand, including peak demand, a well-balanced mix of renewable energies is therefore important. For this reason, it is absolutely essential for a green electricity strategy to develop all kinds of renewable energy technologies.

A complete switch to electricity generated from renewables will only – or at least more easily – be possible for the EU as a whole if the use of the renewable sources available locally is combined with a transregional and transnational grid, which allows an optimal mix of renewable energy using the natural diversity of Europe with its variety of renewable energy sources.

What share of the potential for generating green electricity will be used in the future depends on a number of factors. As a result, different scenarios present different conclusions. In addition, the exploitation of the renewable sources not only requires a cost-effectiveness analysis, but also, for example, an ecological impact assessment, from which further limitations for the use may occur. In this vein, the estimate of the hydropower potential for eastern Turkey, for example, can be questioned.

On the other hand, there are potential estimates for individual countries or individual energy sources which are, in part, considerably higher than the values from the German Aerospace Center study. The European Wind Energy Association estimates that by 2020, around 930 TWh/a could be produced by onshore wind power plants and foresees the long-term potential of offshore wind energy at 3,000 TWh/a (EWEA 2002).

The Universidad Pontificia Comillas, by order of Greenpeace Spain, has calculated the technical potential of renewable energy in Spain for the year 2050 (García Ortega and Cantero 2005). The conclusion of this study is that by 2050, a multiple of the estimated energy demand could be covered by renewable energy. In 2050, Spain is estimated to have an electricity demand of 280 TWh/a and a total energy demand of 1,525 TWh/a. The technical potential of solar energy (solar thermal energy and photovoltaics) is estimated at 8 times the total energy demand, that of wind energy at 1.7 times the total demand and the potential for wave power is estimated at one-fifth of the total energy demand.

The European Renewable Energy Council's (EREC) energy scenario (EREC 2007: 86), like the TRANS-CSP study, comes to the conclusion that in 2050, around 80% of the electricity supply in the EU and the other European countries included in the scenario could be generated from renewable energy sources, a part of which – 15% according to the German Aerospace Center study – would be imports from the southern neighbouring countries bordering the Mediterranean Sea. According to

this scenario, it is assumed that the oil price of 25 USD per barrel in 2000 will rise to 80 USD by the year 2050 – a value which has long been surpassed, which is why a much faster and more extensive development of installations for the use of renewable energies should be assumed.

For the expansion of currently installed green power production capacity, the European Commission's Technology Plan suggests that the installed capacity between 2005 and 2030 could be increased:

- 6 times for wind energy;
- 100 to 200 times for photovoltaics;
- Solar thermal power plants from a capacity of less than 100 MW to 4.6 GWe.

As the energy from some resources can also be used for purposes other than the production of electricity, these alternate uses should also be taken into account in a strategy for the switch towards renewable electricity production. Geothermal and solar energy, for example, can also be used in the heating and cooling sector and biomass is suitable for all three areas of application – electricity, heating/cooling and transport fuel. The optimal use of these energies for a sustainable energy system can only be determined after considering the different regional conditions in order to take advantage of the decentralised availability of renewable energy sources, especially for the purpose of heating and cooling.

The potential for the use of renewable energy for heating and cooling, in particular, is considerable. EREC's "energy (r)evolution scenario", for example, comes to the conclusion that by 2050, half of the demand for heating in the EU – which could be reduced by 50% compared to today via saving measures – could be covered with renewable energy.

Biogas supply strategy

By order of the German parliamentary group Bündnis 90/Die Grünen, the "Institut für Energetik und Umwelt" has analysed the possibilities for a European biogas supply strategy (Thrän et al. 2007). On the premise of complete food self-sufficiency, the present and future bio-methane potentials were calculated. According to this, the calculated biogas potential from 2005 to 2020 could be increased from 300 bn m³N/a to 500 bn m³N/a. As a result, in the medium term the natural gas currently used could be replaced completely. For this calculation, the study takes into account only the existing gas grid, which is technically suitable for the conveyance of bio-methane. However, a full coverage of demand with renewable energy in the gas sector is also only possible if energy efficiency and energy-saving measures are implemented at the same time. The substitution potential would only be sufficient if there were a permanent reduction in the final gas consumption (Thrän et al. 2007: 28).

The question concerning advantages and disadvantages of the production of fuels from renewable resources, on the other hand, is currently under discussion because of the possible ecological impact and particularly because of possible competition with the food sector. In the Directive proposed by the European Commission in January 2008, which contains very detailed standards for the certification of biofuels, a binding minimum share of biofuel in the transport sector of 10% is suggested.

However, there is a growing body of opinion demanding a revision of this target. This discussion is beyond the scope of this study. Nevertheless, other uses of biomass were taken into account in the estimates of the potential for the electricity sector.

To what extent and under what conditions the economical potential for green electricity is finally used to cover the EU's electricity demand depends on the future evolution of that demand. In the years 1990 to 2005, the net electricity generation in the EU-25 rose by around 30%, 11% of which corresponds to the last five years. According to a business-as-usual scenario, the electricity demand in the EU could rise 50% by 2030. According to the Öko-Institut's vision scenario, on the other hand, consumption could stabilise at an only slightly higher level (a 7% rise) (Matthes et al. 2006: 9). The European Commission's energy efficiency scenario also assumes that an increased electricity demand by 2020 could first be counteracted by increased energy efficiency and the development of combined heat and power (CHP) installations (Mantzos 2006: 18). Today, the share of CHP in the electricity production of the EU-27, with an installed capacity of 95 GWe, represents around 11% of the electricity demand. According to estimates of the European Commission, the installed CHP capacity could be around 235 GWe in 2030 at best, which would cover 21% of the expected electricity demand (EC 2007e: 24).

However, in the context of a forced climate protection policy, the share of CHP should be increased, especially via the building and operation of CHP installations with renewable energy (biomass). According to GEMIS, biogas-fuelled CHP plants represent the most environmentally friendly power station technology (GEMIS 2006). As a result of the combined production of heat and power with biogas, these plants even have negative CO_2 emissions.

A strategy for the improvement of energy efficiency should also encompass conversion. Up to now, the biggest conversion losses have occurred in the electricity sector. While the long-term goal is to switch electricity production to renewable energy sources, the current energy policy should also aim to improve fuel flexibility and the energy efficiency of power plants based on coal, natural gas and biomass.

Moreover, the substitution of fossil and nuclear energy sources with renewable energy sources will be all the faster if it is combined with the greening of the energy services demanded by the consumer, including measures concerning energy transducers and consumer behaviour.

A sustainable energy policy must implement strategies for energy savings, energy efficiency and the switch to renewable energy at all political levels. The EU has the potential to direct its energy mix increasingly towards renewable energy. Estimates, such as the one from the German Aerospace Center, show that the EU, the EEA Member States, Switzerland, the Candidate States Croatia and Turkey and the states in the western Balkans have a combined economic potential for the generation of green electricity, which is considerably higher than the current and future electricity demand. That potential is, due to different climatic, hydrological and geological conditions, distributed unevenly across the different regions. Therefore, the complete switch to regenerative power for the EU as a whole will become a reality much sooner if the use of locally available renewable energy sources is combined with a transnational European grid in order to take full advantage of the natural diversity of the renewable energy resources in Europe.

2.2 Current Use of Renewable Energy Sources for Electricity Generation in the EU

How much green electricity is currently being produced in the EU? What is its share of total electricity production? What is the percentage in the individual Member States and how is regenerative power production distributed between the individual Member States? Which renewable energy sources are being used and to what extent? What are the "exploitation ratios" in the individual Member States?

Today, the energy sector with the biggest share produced from renewable energy in the EU is the electricity sector. To a considerable extent, this can be attributed to Directive 2001/77/EC for the promotion of electricity production from renewable energy sources. Following this Directive, the Commission regularly reports on whether the common EU target of a 21% share of regenerative power by 2010 and the indicative targets for the individual Member States are being achieved. In the year 2005, green power's share of gross electricity production in the EU-25 was around 14%. In its 2007 report, the Commission assumes that by 2010 the share of regenerative power will not reach the 21% target, but represent only 19%. While some Member States have achieved positive results, others have even seen a drop in the share of regenerative power in recent years.

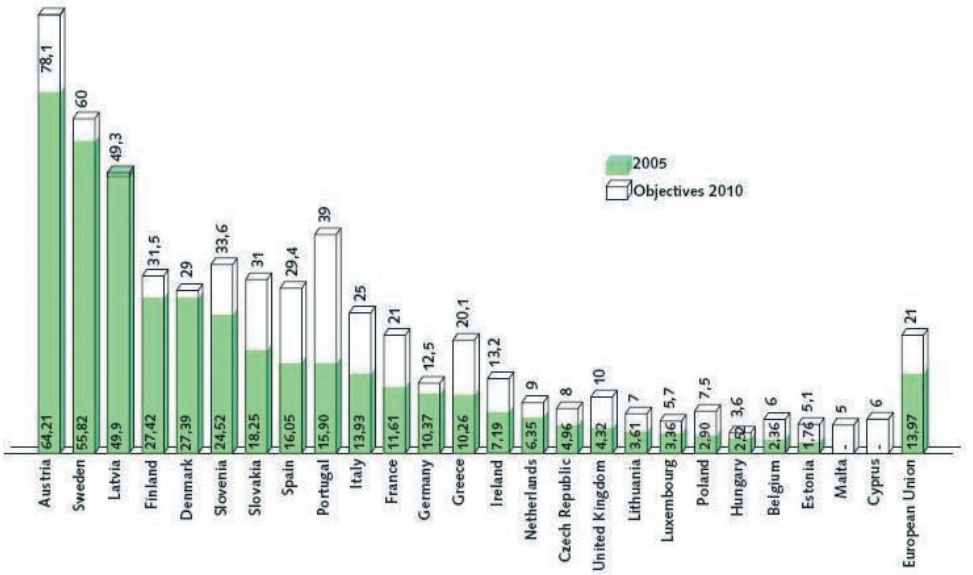
According to the Commission's report, only three countries will achieve the indicative target without problems (Denmark, Germany and Hungary). The Commission mentions good performances for six other countries (Finland, Ireland, Luxembourg, Spain, Sweden, the Netherlands). With additional efforts, five more countries could achieve their respective targets (Czech Republic, Lithuania, Poland, Slovenia, Great Britain), while intensive additional efforts are required from three countries (Belgium, Greece and Portugal), and eight countries were in 2005 very far from reaching their targets (Austria, Cyprus, Estonia, France, Italy, Latvia, Malta and the Slovak Republic).

In 2005 the generation of green electricity amounted to 464 TWh in the EU-27 according to Eurostat data (deviations from the figures in the Commission report are due to the fact that the latter uses provisional figures). The production of regenerative electricity has increased by 50% since 1990, 10% of which occurred between 2000 and 2005. In spite of this increase, however, the share of green electricity in total electricity consumption has increased only slightly, as power consumption rose sharply over the same period. The share of electricity from renewables was around 11.8% in 1990, around 13.9% in 2000 and – as already mentioned – around 14% in 2005. On the other hand, its share would have dropped below 7% without the strong increase in the generation of green electricity over the period in question.

An important point to be highlighted here is the change in the structure of the renewable energy sources used. While electricity production from hydropower declined, "new" renewable energies gained importance. The following growth rates for electricity production are especially significant:

- Photovoltaics: In 1990 there was a generation of 5 GWh, in 2000 around 117 GWh, and five years later generation had increased more than tenfold to 1490 GWh;
- Biomass: Production rose from 17 TWh to 40 TWh in 10 years, and then doubled over the past five years;

Fig. 4: Share of renewable energy in gross electricity consumption in the EU 2005 (in %)



Source: European Commission – http://ec.europa.eu/energy/res/index_en.htm

- Wind energy: In the period between 1990 and 2000 generation rose from 0.7 TWh to 22.3 TWh and after that it increased with average annual growth rates of more than 25% to over 70 TWh in 2005.

In 2005, shares in the EU's green electricity generation were the following:
- Hydropower 66.1%
- Photovoltaics 0.3%
- Wind 15.2%
- Biomass 17.2%
- Geothermal energy 1.2%

How is the amount of regenerative electricity generated in the EU distributed regionally? The shares of the individual Member States in the total amount as well as in the amount of electricity generated from the individual renewable sources are quite different. For instance, 1.28 TWh of the total 1.49 TWh produced by photovoltaic installations in the EU were generated in Germany. The electricity from geothermal installations was almost exclusively produced in Italy. Nearly two-thirds of the electricity from hydropower came from France, Italy, Austria and Sweden. Concerning biomass-produced electricity, only 5% came from the new Member States, and more than three-quarters of electricity from wind energy was produced in Denmark, Germany and Spain.

These numbers clearly show that countries' production shares are not only determined by their respective renewable energy potentials, but that political and economic conditions in the individual Member States also play an important role. If one looks at the total amount of green electricity produced, the following distribution can be found: 23% of production was concentrated in the north of the EU in

Sweden and Finland; Ireland and Great Britain only accounted for 4%; the Benelux countries and France accounted for 15%; the share of the Iberian peninsula was 11% as well as for Italy; 16% was produced in Denmark and Germany; over 9% in Austria and Slovenia; Bulgaria and Romania accounted for 5%; the other central and eastern European countries which joined the EU only produced 4% and Greece, Malta and Cyprus produced only 1% of the total amount. In 2005, the Candidate Countries Turkey and Croatia together produced 46 TWh of electricity from renewable energy sources – this equals 10% of the amount produced in the EU – and Norway produced 137 TWh, an amount that exceeds that produced in Sweden, Finland, Denmark and the United Kingdom and Ireland together. The distribution reflects, on one hand, the dominance up to now of hydropower in the renewable energy mix and, on the other, that different importance is attached to the use of renewable energy on the national level.

Chart 10 shows the regional distribution of the total amount of 687 TWh of regenerative power produced in the aforementioned countries in 2005. In comparison, chart 11 clearly shows that the spatial distribution of the amount of green electricity produced does not correspond to the spatial distribution of the corresponding potentials. If one compares, in a simplified manner, the amount of electricity produced from renewable energy sources in 2005 to the estimated economic potential contained in the German Aerospace Center study, it becomes apparent how small a part of the potential is actually being exploited (cf. tables in Appendix).

In 2005, the EU exploited the economic potential from renewables for electricity production as follows:

- Geothermal energy 3%
- Biomass 12%
- Photovoltaics 1%
- Wind energy 5%
- For hydropower the exploitation rate was around 64%.
- Electricity generation from wave and tidal power does not yet have a market share. Concentrated solar power plant technology is currently being used in the first commercial installations.

Overall, only a small share of the potential for electricity production from renewable energy sources available in the EU – little more than one-tenth – is currently being used. Even when Iceland and Norway – who cover their total electricity consumption from renewable energy sources – Switzerland, Croatia and Turkey are included in these calculations, the overall exploitation ratio of the economic potential is still only around 12%. Only in Austria, Norway and Switzerland is more than 40% of the economic potential used. Today, in the west, south and east of the EU, the possibility for a switch to green electricity is taken only to a very low degree, in some areas even not at all. Europe is only at the beginning of the development of its own renewable energy sources.

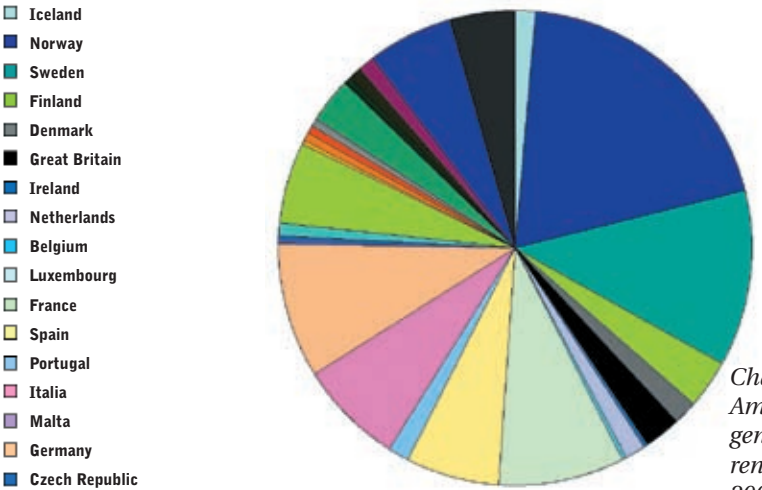


Chart 10
Amount of electricity generated from renewable energies in 2005 (687 TWh)
Source: Eurostat

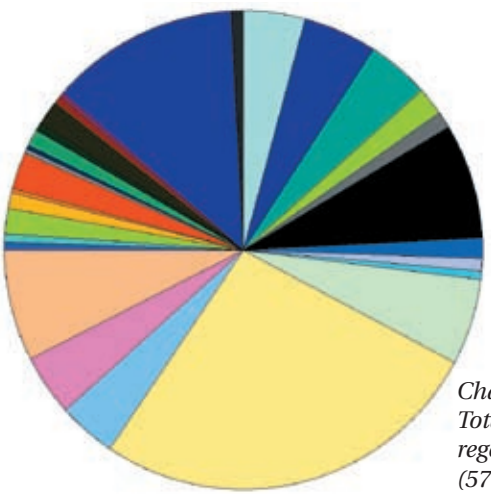


Chart 11
Total potentials for regenerative electricity (5778 TWh)
Source: GSA

2.3 Obstacles to and Conditions for an Increased Use of Europe's Renewable Energy Sources

Why have renewable energy sources hitherto been used so little in the EU? The reasons for this are manifold, and are the subject of extensive research, discussion and documentation in the worlds of science, politics and business. In this chapter only a concise summary of those reasons will be given to highlight the scope of tasks a policy strategy aiming to increase the use of renewables is facing. The analysis will focus on the electricity sector and on the obstacles and possible actions from the European perspective (see also Appendix 2 for a list of obstacles to their use and necessary measures; source: EC 2007e, Technology Map).

From the economic point of view, the question of the competitiveness of regenerative electricity and the structure of the electricity market are primarily responsible for the limited use (with the exception of the larger hydropower

plants) of renewable energy sources for electricity production. The production costs of electricity are only one aspect, albeit an essential one. Low oil prices and high investment costs for the installations to generate green electricity have led to a competitive disadvantage for energy from renewables in the past. However, due to global changes on the energy markets, the times of low oil prices are definitely over. The developments on the energy market are now defined by rising oil prices and falling investment costs for renewable energy installations. For photovoltaic installations, for instance, the Commission expects 50% cost-reductions by 2020. The result of this development is that, on the whole, a change in the energy mix in favour of renewable sources will lower costs. However, the generation costs for regenerative electricity will be different, depending on the technology and the location-specific conditions.

Competition between the individual energy sources is structurally distorted for several reasons. A very basic structural distortion of the competitiveness of renewable energy occurs when the external costs of electricity production from fossil and nuclear energy sources are not taken into account. A decisive step towards an internalisation of the costs in terms of climate damage through CO_2 emissions was taken with setting up the European Emissions Trading Scheme. Full auctioning of emissions certificates – as proposed by the Commission – will lead to a permanent evolution of production costs of coal power, which will favour renewable power. However, a further EU-wide measure for the adequate internalisation of the costs generated by nuclear electricity is still to be taken. The European Commission's impact assessment of the draft Directive for the promotion of the use of renewable energy sources demonstrates how the development of oil prices and the Emissions Trading Scheme will tip the profitability balance in favour of renewable energy.

The competition on the electricity market is also heavily distorted by the subsidies allocated in the past decades – and still continuing today – to coal and nuclear power. These originated, to a large extent, in the special treaties on which the ECSC and EURATOM were founded. To bring renewable energies into the distorted market, support schemes are necessary. The European Commission has recognised this in its state-aid guidelines. Feed-in tariffs have proved to be the most effective and cost-efficient way of promoting the generation of green electricity. These feed-in tariffs are ordinarily not state aids, but they guarantee electricity suppliers the purchase at a fixed price. The costs are passed on to the price of electricity. Up to now, the support schemes for electricity from renewable energy sources have only been organised at the national level and the financial support is limited to the renewable electricity generated within the national borders. In the draft Directive of January 2008, the Commission does not propose a full or a partial harmonisation of the support schemes with binding minimum requirements based on best practices.

However, measures taken for improving the competitiveness of green electricity will have limited effect as long as no real market with competition exists in the electricity sector (as in the gas sector) at the national level, and even less at the European level. The main reasons that no EU-wide competitive electricity market exists are the domination of the market by a few companies, the high degree of vertical integration between production and network operation and distribution, and the lack of grid infrastructure for cross-border electricity trade.

Therefore, in September 2007 the European Commission presented a third legislative package for the creation of an internal European electricity market (EC 2007d). This package contains measures for:

- separating production and supply from the operation of the transmission and distribution networks, because vertically integrated companies use those networks as market-entry barriers for competitors, in particular for the many decentralised producers of green electricity, in spite of their right to network access and priority feed-in;
- enhancing the competencies and independence of the National Energy Regulators;
- creating a European agency with binding decision-making powers for the co-operation between the National Energy Regulators;
- efficient co-operation between transmission system operators, which should provide a framework for the planning, financing and management of research and innovation activities and for the co-ordinated planning of network investments, including the supervision of the grid development;
- improving transparency concerning grid capacities;
- the gradual creation of a European end-user market.

This legislative package will be crucial for the enhanced use of Europe's renewable energy sources in the electricity sector and for the ERENE project.

Concerning technology, there have clearly been a number of essential developments in the area of renewable energies over the past few years. However, the need for further research and development to promote the use of all kinds of renewable energy sources, increase efficiency and lower costs remains significant. Research and development is particularly needed in turbines and platforms for the installation of offshore wind parks, and in storage technologies, which are of great importance for an increased market penetration of renewable energy.

A particular problem for the switch to renewable energy sources is the current network infrastructure. This is oriented to electricity generation based on fossil and nuclear in large and centralised power plants, to which fuels are conveyed over a transport infrastructure which has often been built specifically for this purpose (i.e., pipelines). Moreover, most grid systems are still limited to the national territories. For a switch to green electricity, there would be different needs. For instance, decentralised and often small production units must be connected, which means that electricity needs to be collected at the locations of the renewable energy source; completely new locations with high potentials for electricity generation (e.g., offshore wind parks) must be connected; electricity from fluctuating resources must be integrated into the system; and for an internal European market, many more interconnections between the Member States need to be established.

Although the Member States of the EU agreed already in 2002 to increase the minimum degree of connection between themselves to at least 10% of their national energy demand, nine Member States have not yet reached that target. As a result, the electricity networks in the EU allow only for a very limited amount of cross-border electricity trade. Over 60% of the projects declared of European interest by the Council and the European Parliament have suffered considerable delays in their

realisation, and each year only 200 million EUR are invested in cross-border networks in the whole of the EU. Therefore, the Commission is warning that if investments in infrastructure continue according to a business-as-usual scenario, the EU will not be in a position to create a real internal market and it will not be able to answer the increased need for electricity production from renewable energy sources (Com SEC 2006: 1715; EC 2007b: 12).

With regards to the systemic integration of renewable energy, important improvements can be observed. For instance, in some EU countries the forecasting methods for the feed-in of wind and solar energy have improved considerably, and modern wind energy installations are now feasible to be operated remotely on demand. Also, so-called overhead line monitoring enables optimal charging of the available network infrastructure. Nevertheless, considerable further research and development efforts are needed, particularly in intelligent-demand management and the use of communication technologies to connect different electricity generation installations to form virtual combined power plants. Through that, the required amount of electricity from renewable energies can be supplied on demand. The Commission's Technology Plan contains a list of research needs, and the EU continues to support such developments through such projects as GreenNet.

Nevertheless, it is not only in the area of research and development that increased attention should be directed at renewable energy requirements. Professional training and degrees in engineering need to be promoted. Rapid market penetration often fails to materialise due to the lack of specialists present to give consultations and install renewable energy facilities. And, last but not least, administrative processes also often constitute an obstacle for renewable energy.

Such administrative obstacles have been described, analysed and assessed by the OPTRES project (Assessment and optimisation of renewable support schemes in the European electricity market) (cf. Coenraads et al. 2006), and, on the basis of this project, addressed by the European Commission in its draft Directive for the promotion of the use of renewable energy sources. The fundamental administrative obstacles include:

- high number of administrations involved in the approval of installations and also in relation to support-schemes;
- a long approval procedure, which creates uncertainty among investors;
- insufficient consideration for the possible use of renewable energy sources in urban and regional planning;
- a lack of transparent network access conditions;
- the high costs of connection to the grid.

Both the third legislative package for an internal electricity market and the energy and climate package propose measures to reduce or abandon these obstacles, which should be included in Member States' respective renewable energy action plans.

The reasons why renewable energy sources have so far been only marginally employed in the EU are manifold. They are both economic – caused by the distortion of competition in favour of electricity from coal and nuclear plants, by the externalisation of environmental damage costs and risks, and by subsidies – and technical, especially in relation to the lack of adaptation of the network infrastructure to the requirements

of the use of renewable energy sources. Research and development are not yet sufficiently directed at the utilisation of renewable energy sources, and the use of available technologies is hampered by over-burdening administrative procedures. All levels within the EU's multi-level system must be engaged in abandoning these obstacles in order to achieve a sustainable energy policy within a relatively short timeframe. At the European level, the main task is to take measures to improve the competitiveness of renewable energy and create the conditions necessary for an internal market for green power. In some areas, there are already European regulations; in others, legislation has been presented. Even so, further measures must be taken in order to develop and use Europe's sizeable renewable energy potential.

3
A European Community for Renewable Energy: Objectives, Tasks, Instruments, Legal and Institutional Foundations

Renewable energies are of central importance for combating climate change, ensuring security of energy supply and strengthening the EU's competitiveness. However, the abundant and multifaceted potential of renewable energies of the EU is currently used only to a very low extent. As such, the fact that the EU Member States were able to unite towards a common goal in 2007 – namely the 20% renewable energy target by 2020 – is a great step forward when considering that there are tremendous differences in the energy mix by Member States and different perceptions concerning the future role of nuclear power. The draft Directive on the promotion of the use of renewable energy sources, submitted by the European Commission in January 2008, takes into account the national specificities of individual Member States by allocating differentiated national targets in line with the respective national economic conditions. These national targets are then to be achieved by way of National Action Plans (NAP).

Naturally, every Member State is free to pursue its energy policy in such a manner that by 2020, a greater share of renewable energy will be achieved than prescribed by the Directive, which ultimately only sets a binding minimum target. It is also to be expected that at some time the EU will put forth objectives for the period after 2020. However, it is extremely uncertain that the EU as a whole will be able to agree on measures that go beyond the targets of the Directive already in the near future. The crucial question then is: Which options are available to those Member States that wish to utilise the current timeframe in order to pursue a more long-term path of development, not only by action at the national level, but also by common action at the European level?

Establishing a European Community for Renewable Energy (ERENE) would provide such an option. A Community of ambitious renewable energy front-runners could either be created as a new community based on a separate treaty, like EURATOM, or as a group for enhanced co-operation between some of the Member States through a decision of the Council under the aegis of the EU.

The following sections will first define the objectives and tasks of ERENE aiming to make better use of the renewable energy potential. The focus will be on the electricity sector. For the definition of the tasks of ERENE, the subsidiarity principle should be respected and attention should be paid to the fact that some energy-related political measures should be applied to the EU as a whole – particularly when it comes to regulations touching the internal market.

Which instruments should ERENE have at its disposal in order to fulfil its responsibilities? The proposals made in this study will draw inspiration from the instru-

ments and financial mechanisms already in use at a European level and within the framework of the EURATOM Treaty in particular. Renewable energies have such an importance for the future of the EU and offer so many chances for sustainable development that measures to promote their development and use should be taken on the EU level, if – as we witness in other policy areas – common action is superior to individual state action.

Lastly, the legal and institutional foundations of such a Community on the European level – which must not include all the Member States of the EU from the beginning, but shall be open for all of them – will be discussed. In this context, we will assume that the new Treaty of Lisbon with its amendments to the current Treaties will be in force.

3.1 Objectives and Tasks of ERENE

The economic potential of renewable energies in the EU far surpasses its current utilisation. Europe is still at an early stage in the development of its own renewable energy sources. Therefore, the following objective is proposed for ERENE:

The European Community for Renewable Energy (ERENE) shall contribute to the protection of the environment, the security of energy supply and the competitiveness of the European Union by increasing its use of renewable energy sources.

This objective, as explained in chapter 1 of this study, is one pillar in a strategy for a sustainable energy policy, which – together with those of energy efficiency and energy savings – should be the leading principles for a common energy policy within the EU as well as for its foreign energy policy. As regulations concerning the improvement of energy efficiency often have a direct impact on the competitiveness in the internal market, such measures should apply to the entire EU. That is the reason why in this study it is not proposed that ERENE should be assigned regulatory competency in this area. However, the Member States of ERENE should commonly commit themselves to push the EU to take strong decisions for higher energy efficiency and more energy savings.

ERENE's responsibility should be to promote the development and use of renewable energy sources by common actions. ERENE's task should therefore not consist of determining higher national targets for the use of renewable energy sources – as they are defined by the EU Directive for the promotion of the use of renewable energy sources – nor to set other specifications for the National Action Plans. Instead, ERENE's task should be to take common actions at the supranational level, in order to take advantage of economies of scale, burden-sharing and in particular the common market. In this sense it is a community programme that paves the way for a development which goes beyond the targets of the Directive and provides the conditions for the increased use of renewable energy sources, which cannot – or only less efficiently – be achieved by national action only.

Defining the tasks of ERENE, the subsidiarity principle should be respected, according to which action shall be taken on the supranational level only in cases where action at a local, regional or national level is insufficient or the task cannot be fulfilled or only under less advantageous conditions.

In energy policy the subsidiarity principle is closely related to the principle of decentralisation in energy production and supply. Renewable energies better enable a realisation of this principle than is the case in a supply structure based on fossil fuels and nuclear energy. This change is one of the significant social and economic advantages of a renewable energy supply-structure and is applicable in a European as well as in a global context, particularly in developing countries that urgently need an improvement of their energy supply.

Growing use of renewable energy will increase the degree of decentralisation of energy supply for heating and cooling as well as for the electricity sector, on which the tasks of ERENE shall be concentrated. Due to the settlement structure in the EU, and due to the geographical distribution of renewable energy sources and their potential across the EU, it is obvious that to enable the shift in electricity production to renewable sources, a combination of decentralised supply-structures with common measures on a regional and transnational level will achieve better results than each of the strategies alone.

The study's analysis of the EU's renewable energy potentials (see chapter 2) shows that a complete switch from fossil fuels and nuclear power to electricity generated from renewable energy sources is not an unachievable utopia. The potential for generation of green electricity is currently only used to a very modest degree in the EU. Table 3 compares the amount of electricity generated from renewables in 2005 in the EU Member States, Norway, Iceland, Switzerland and the Candidate Countries with the potential green energy that could be generated. This provides a simple picture of the share of the renewable electricity potential currently used.

Table 3 shows that there is by far enough economic potential for electricity from renewable sources, which was estimated for the year 2050, to completely cover the electricity demand in the EU. If in addition the significant potential of Turkey and Norway as well as the Balkan States is taken into account, the excess of the economic potential for generating green electricity compared to the current production in the EU and the other countries included is even greater.

Table 3 clearly emphasises that the use of renewable energy sources is still in its infancy in the EU. Currently, only around 10% of the potential for electricity production from renewable energy sources is exploited. Even in a country like Austria, which already covers more than half of its electricity demand with electricity from renewables (primarily hydropower), the economic potential of the renewable energy sources to generate electricity is double the amount currently produced. Apart from Austria, Sweden is the only other country in the EU that already makes use of more than one-third of its estimated long-term potential. In Switzerland as well as in Norway, half of their respective electricity production is generated from hydropower.

The significant potential from renewable energy sources other than hydropower, remains, for the most part, in some countries even fully unused (see detailed table on the calculated utilisation quotas by energy source and by countries in the Appendix). In the west of the EU, Ireland and the United Kingdom as well as France still fail to use their significant wind energy potential. In the north, Norway's and the other Scandinavian countries' potential for electricity generation from hydropower, wind power and biomass could be further tapped. In the east, Poland alone fails to employ a biomass electricity potential of more than 100 TWh. In central Europe, Germany could generate more than six times its current amount of green electricity. The poten-

Table 3: Electricity generation from renewable sources in 2005 and the economic potential for regenerative electricity – by country

State	Renewable electricity production in 2005 in TWh	Share of renewable electricity in 2005 in % of demand	Economic potential for renewable electricity in TWh	Utilisation of potential 2005 in %
EU-27	464.3	14.0	4377.0	10.6
BE	2.63	2.8	23.2	11.3
BG	4.34	11.8	31.4	13.8
CZ	3.14	4.5	29.9	10.5
DK	10.61	28.2	65.1	16.3
DE	64.66	10.5	433.6	14.9
EE	0.097	1.1	14.0	1.0
IE	1.87	6.8	67.9	2.8
EL	6.41	10.0	89.5	7.2
ES	43.96	15.0	1513.1	2.9
FR	58.44	11.3	329.7	17.7
IT	49.75	14.1	237.2	20.9
CY	0.001	0	27.9	0
LV	3.41	48.4	9.0	40.0
LT	0.46	3.9	16.0	3.0
LU	0.24	3.2	2.2	10.9
HU	1.93	4.6	70.5	2.7
MT			2.3	
NL	8.92	7.5	56.3	15.8
AT	39.25	57.4	96.6	40.6
PL	4.17	2.9	129.9	3.2
PT	8.56	16.0	220.1	3.9
RO	20.21	35.8	69.8	29.0
SI	3.58	24.2	16.0	22.3
SK	4.65	16.5	22.5	20.6
FI	23.56	26.9	104.3	22.6
SE	82.05	54.3	240.9	34.1
UK	17.48	4.3	450.8	3.9
HR	6.35	36.1	24.4	26.0
MK			7.3	
TR	39.75	24.7	723.4	5.5
IS	8.68	99.9	233.8	3.7
NO	136.68	108.4	290.7	47.0
CH	31.23	47.4	50.0	62.5

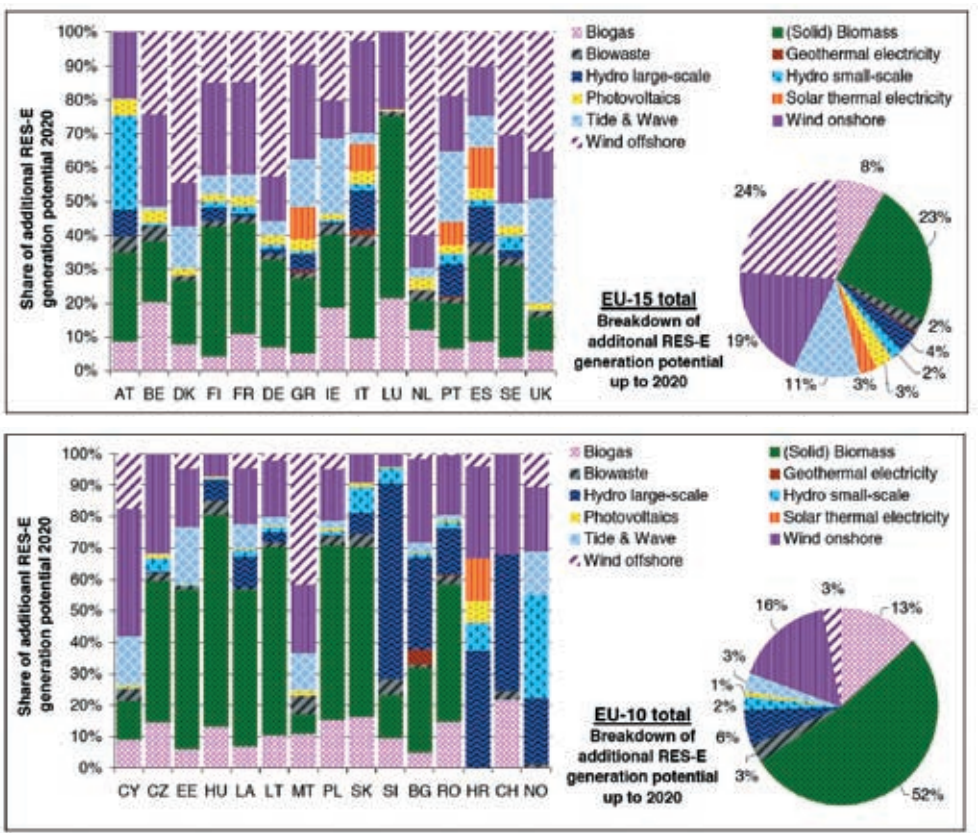
Source: Eurostat; DLR 2006

tial of wind energy alone is estimated to be ten times higher than the amount generated in 2005. Last but not least, the EU Member States and Candidate States in or near the earth's sunbelt have the potential to cover half of the EU's electricity demand from renewable sources.

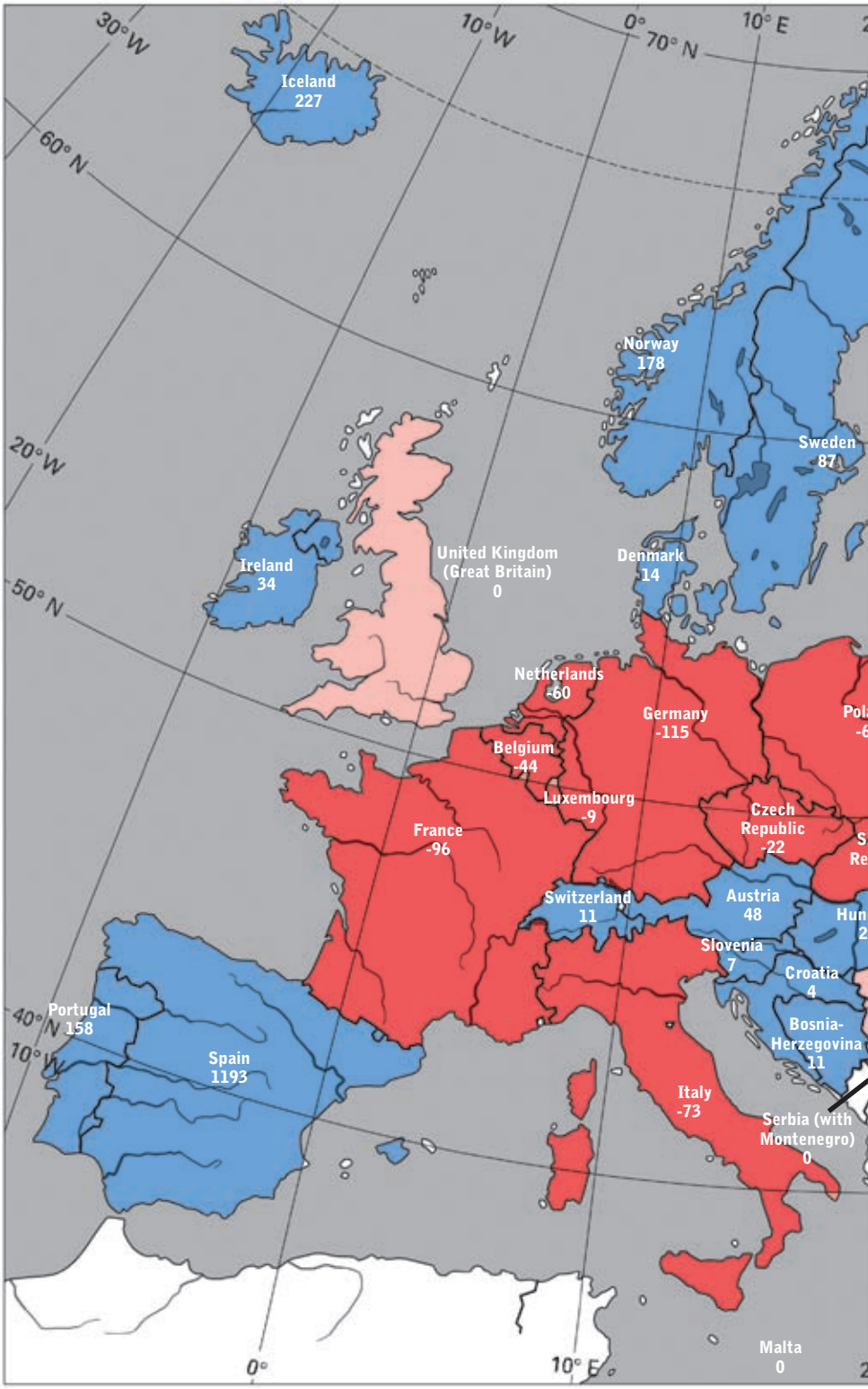
The GreenNet study ordered by the Commission also estimates the additional potential for green electricity generation in the individual Member States of the EU (see Fig. 5), although only that which could be activated by 2020. According to this study, the main source of domestic renewable energy currently wasted, in the sense that it is used to a low degree only, in Belgium, the Netherlands, Denmark, Germany, Ireland and the United Kingdom is wind energy. Italy, Spain, Portugal and Greece have large unused potential for solar power. The Czech Republic, Hungary, Poland, Slovakia, Romania and the Baltic States are only partially utilising their potential for electricity generation from biomass. In Slovenia and Bulgaria the potential of hydropower is not fully used to date, and for Ireland, the United Kingdom and Portugal, wave energy could play a significant role in electricity generation.

The differences in the amounts and the composition of renewable energy sources available in the individual Member States reflect the EU's climatic, geological and hydrological diversity. Some countries have a "surplus potential", meaning that their economic potential for renewable electricity production exceeds their current and future electricity demand, while for other countries a complete shift from fossil and nuclear power to electricity generated from renewable sources can only be realised if they have the possibility to import green electricity. In a European internal market for regenerative electricity, such needs for imports could be met with intra-European electricity trade.

Fig. 5: Potential for green electricity generation in the individual Member States of the EU



Source: GreenNet study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Sweden
87
Ireland
34
United Kingdom
(Great Britain)
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Denmark
14
Netherlands
-60
Germany
-115
Pol
-6
Belgium
-44
Luxembourg
-9
France
-96
Czech
Republic
-22
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Re
Switzerland
11
Austria
48
Hun
2
Slovenia
7
Croatia
4
Bosnia-
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Portugal
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Spain
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Italy
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Serbia (with
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Malta
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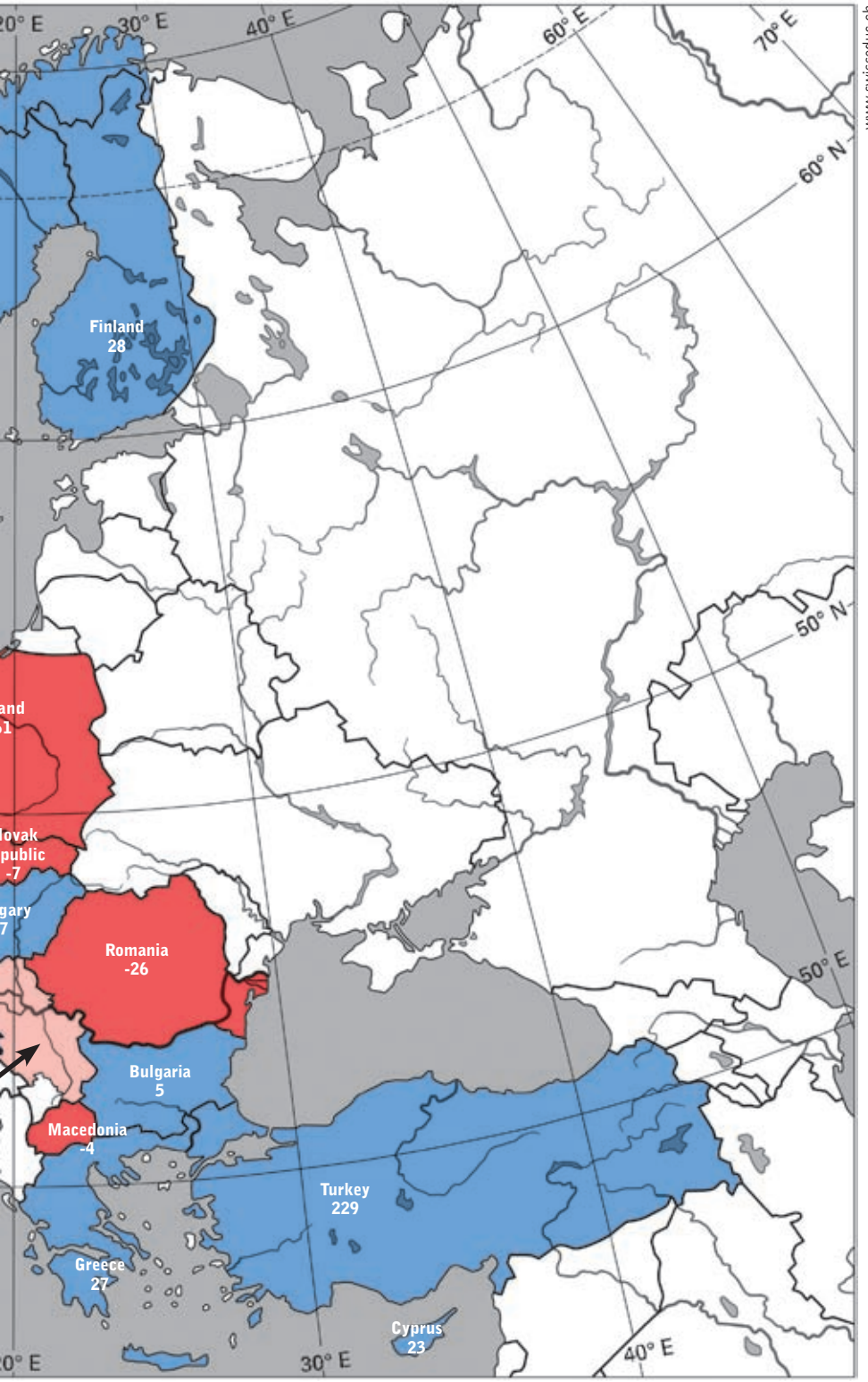


Net balance of renewable electricity potential compared to electricity demand (rounded)

Table 4 (DLR study) shows a country-by-country comparison of the estimated electricity demand by 2050 with the economic potential for regenerative electricity production and the resulting "potential coverage quotas" with green electricity. The map below shows that the highest long-term export potential for regenerative electricity in absolute numbers can be found in Sweden, Portugal and Spain. Austria, Denmark, Finland, Ireland, Hungary and Greece could also become exporters of regenerative power, and Turkey and Norway could also increase exports significantly. The islands of Malta and Cyprus have sufficient potential to cover their electricity demand with power generated from their own renewable sources, with Cyprus in particular possessing an economic potential which significantly exceeds its current

Table 4: Estimated electricity demand in 2050 compared to the total economic renewable electricity potential by country. RED indicates the countries where the domestic renewable electricity potential is less than the estimated demand

In terawatt hours per year	Estimated electricity demand 2050	Potential regenerative electricity	Potential share of coverage
Belgium	67.0	23.2	35%
Bosnia-Herzegovina	17.8	29.2	164%
Bulgaria	26.5	31.4	119%
Denmark	51.1	65.1	127%
Germany	548.8	433.6	79%
Finland	76.4	104.3	137%
France	426.0	329.7	77%
Greece	62.1	89.5	144%
United Kingdom	451.2	450.8	100%
Ireland	34.0	67.6	199%
Iceland	6.6	233.8	3,567%
Italy	310.6	237.2	76%
Croatia	20.3	24.4	120%
Luxemburg	10.9	2.2	20%
Malta	2.4	2.3	95%
Macedonia	11.5	7.3	63%
Netherlands	116.0	56.3	48%
Norway	112.0	290.7	259%
Austria	49.0	96.6	197%
Poland	190.9	129.9	68%
Portugal	62.0	220.1	355%
Romania	96.1	69.8	73%
Sweden	153.7	240.9	157%
Switzerland	39.4	50.0	127%
Serbia (with Montenegro)	49.2	48.8	99%
Slovakia	29.5	22.5	76%
Slovenia	9.3	16.0	171%
Spain	320.1	1513.1	473%
Turkey	494.1	723.4	146%
Czech Republic	51.7	29.9	58%
Hungary	43.9	70.5	161%
Cyprus	5.0	27.9	558%
Total	3,945	5,738	145%

Source: DRL 2006: 59

electricity demand. On the other hand, there would be countries that need to import in order to completely cover their electricity demand with green power. France, Germany, Poland and Italy would be the countries with the biggest import demands in absolute terms. The Czech Republic, Belgium, Luxemburg, the Netherlands and Slovakia could also be import countries in a European market for green electricity.

The above table clearly illustrates that for at least one-third of the EU Member States, it would be difficult or even impossible to make the complete switch to green electricity with a strategy that is limited to the use of renewable energy sources located and available only within their national boundaries, while in other countries huge potentials would remain unused due to such a purely national strategy. It is apparent that a strategy combining the use of electricity generated from local sources with a strategy to create a European, internal green electricity market based on an integrated network for green electricity is not only a question of solidarity, but also offers new opportunities for an ecological modernisation of the electricity sector and for the realisation of the vision to cover the EU's total electricity demand with renewable energy.

In order to utilise Europe's significant renewable energy potential, it should be ERENE's task to contribute to the provisions that are necessary for an increased use of renewable energy and for the creation of an internal market for green electricity.

ERENE shall contribute to create the conditions for increasing the use of renewable energy sources for electricity generation. In order to perform its task, the Community shall:

- **promote research and development and ensure the dissemination of know-how;**
- **support innovation by setting up demonstration plants;**
- **contribute to the development of a European electricity grid;**
- **support investments in electricity generation from renewable energy sources;**
- **contribute to the functioning of a common market for green electricity;**
- **promote co-operation with other countries in the area of renewable energy.**

3.2 Competencies and Instruments of ERENE

a) Support of Research, Dissemination of Know-How, Establishment and Operation of Demonstration Plants

In its Communication "A European Strategic Energy Technology Plan (SET Plan)", dated November 2007 (EC 2007f,: 723), the Commission stated: "In the longer term, new generations of technologies have to be developed through breakthroughs in research if we are to meet the greater ambition of reducing greenhouse gas emissions by 60–70% by 2050."

Although significant progress has been made in recent years in technologies for the use of renewable energy of the so-called second generation, there is an urgent need for further research in order to accelerate the development of new technologies, to bring them to the market, and to lower the costs. The Commission lists the key tasks for research and development: further improvement of wind turbine technologies – especially for offshore facilities – photovoltaics, and the development of cost-efficient energy storage technologies. Most important, however, is to "enable a single, smart

European electricity grid able to accommodate the massive integration of renewable and decentralised energy sources." Wave and tidal energy plants are further topics of research for renewable energy technologies of the third generation.

Today, there is a clear mismatch between the magnitude of the energy and climate-change challenge and the current level of research on energy, as the Commission has stated while drawing attention to both on the European level as well as in many individual Member States. According to the Commission, the situation is as follows: "If EU governments were investing today at the same rates as in 1980, the total EU public expenditure for the development of energy technologies would be four times the current level of investment of around 2.5 billion euros per year," (EC 2007f: 3).

In the EU budget, there is an annual average of 886 million EUR for the period 2007–2013 dedicated to energy research within the 7th Research Framework Programme. However, most of this money is allocated to the EURATOM programme. For the period 2007–2011, an average of 550 million EUR per year is dedicated to nuclear energy research. For another EU programme, "Intelligent Energy – Europe", the budget for the seven-year period amounts to 730 million EUR – an annual average of only 104 million EUR. As this budget is intended for all energy-related issues, only a part of it will end up flowing into renewable energy programmes.

Looking at the figures of the 7th Research Framework Programme, it becomes clear that nuclear energy research is favoured and that there is a heavy imbalance in the allocation of funding to the disadvantage of research on renewable energy. The dominance of nuclear energy research is characteristic of the entire history of common European research. The main reason for that imbalance can be seen in the existence of EURATOM as a special community for the development of the nuclear industry.

It is therefore worthwhile to look into the EURATOM Treaty when defining the instruments that ERENE should have at its disposal for promoting research, the dissemination of know-how and setting up pilot plants. In the light of today's political climate – in which political intervention into the market is often seen very critical and in which the subsidiarity principle is always stressed in order to keep the supranational competencies limited – the competencies and instruments given to EURATOM to develop the nuclear industry look very strong and far-reaching, That makes it obvious that the energy sector is really not a "level playing field" with equal competition. As such, the competitive disadvantages that renewable energy faced over decades and up to the present day must at least be balanced for reasons of fair competition.

According to the EURATOM Treaty, not only research and training programmes should be implemented for the nuclear industry; EURATOM also established from the outset a special common research institute on the supranational level, namely the Joint Nuclear Research Centre. Meanwhile, this Joint Nuclear Research Centre has been converted into the Joint Research Centre (JRC), with a significantly expanded spectrum of research. Today its tasks also include research on renewable energies. The JRC now includes seven institutes. One is the Institute for Environment and Sustainability, located in Ispra, Italy, with 474 staff (for research and administration; more than one-third is visiting staff). One of its seven units is specialised on renewable energy, and its work is important not only because of its own research activi-

ties, but also for its documentation of developments in renewable energy technologies. However, nuclear research is still a core business of the JRC. This is the case, for example, for the Institute for Transuranium Elements in Karlsruhe, Germany, and the Institute for Energy in Petten, The Netherlands.

According to its founding treaty, EURATOM also has the competency to set up schools for the training of specialists within the framework of the Joint Nuclear Research Centre, and to establish an institution with university status. So far, however, no use has been made of the latter competency.

It is of particular interest that the EURATOM Treaty provides for the possibility that "undertakings, which are of fundamental importance to the development of the nuclear industry in the Community may be established as Joint Undertakings," – as is the case for the ITER project, for example.

ITER

The Council again made use of the provision of the EURATOM Treaty to establish a joint undertaking in its decision of 27 March 2007 "establishing the European Joint Undertaking for ITER (International Thermonuclear Experimental Reactor) and the Development of Fusion Energy." This joint undertaking is the EURATOM contribution to the ITER organisation, to which six other parties belong. Its tasks include the construction, operation, utilisation and finally the decommissioning of the ITER facilities.

The joint undertaking, headquartered in Barcelona, was established for a period of 35 years, that is, until 2041. The joint undertaking is awarded advantages such as exemption from VAT. It has its own budget (with its own financial regulation), financed by contributions from EURATOM, the ITER host state (France), the annual membership contributions and voluntary contributions. The total resources required are estimated at 9.6 billion EUR with a contribution from EURATOM (from the EU budget) estimated at 7.6 billion EUR.

The ITER project underlines the discrepancy between nuclear and renewable energy research efforts at the European level. The European Commission has announced various initiatives in the SET plan for 2008 to promote the development of technology for renewables. Thus, in addition to creating a European Energy Technology Information System, various European Industrial Initiatives are intended to be implemented in order to align the research and development activities of the EU, Member States and industry. The initiatives announced are the European Wind Initiative, Solar Europe, Bioenergy Europe, and the European Electricity Grid Initiative with the creation of a European Centre to implement a research programme for the European transmission network. In addition, it is proposed to initiate in 2008 an action on "European energy infrastructure networks and systems transition planning".

The initiatives announced by the Commission are to be appreciated. However, the problem remains that for actions that go beyond the finances dedicated in the 7th Research Framework Programme to direct and indirect research projects and to research co-ordination on renewable energy, no further financial resources are available in the multi-annual financial framework of 2007–2013, for example for setting up large-scale demonstration plants. That means essential time for further developing renewable energy technologies and maintaining the current European lead in

technological development in the continually growing world market for renewable energy technologies is insufficiently used on the Community level. The Commission has therefore announced a "Communication on financing low carbon technologies" for the end of 2008, in which – among other questions – the pros and cons of "creating a new European mechanism/fund for the industrial-scale demonstration and market replication of advanced low carbon technologies" will be examined. Although the Environment Council welcomed the announcement of such a Communication in February 2008, its consequences on the promotion of research are uncertain.

Following the example of EURATOM, ERENE should be equipped with sufficient and effective instruments to promote joint research in the field of renewable energies more strongly than is currently the case at the EU level. In particular, the competency to establish and operate demonstration plants should be conferred upon ERENE in order to answer further research questions and to accelerate market penetration of new technologies – be these plants for offshore wind power, wave and tidal energy, or solar energy.

ERENE Member States should provide ERENE with the necessary competencies to:

- **implement joint research programmes;**
- **establish and operate joint research institutes;**
- **establish demonstration facilities for the generation and distribution of energy from renewable sources;**
- **support training programmes through the promotion of university chairs, fellowships or exchange programmes.**

b) Development of a Trans-European Grid for Electricity from Renewables

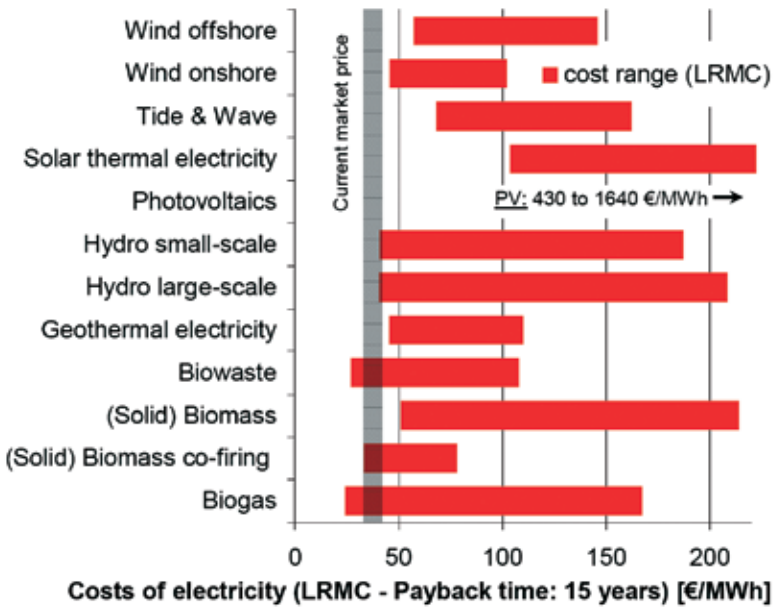
The existing network infrastructure forms one of the major technical-economic obstacles to an increased use of renewable energy sources (see chapter 2.3). It is completely directed to the carbon economy and nuclear power. This is also the case for the majority of new investments, such as the construction of liquefied natural gas (LNG) terminals or new pipelines.

Major problems arise from this centralised structure of the transmission and distribution infrastructure for the integration of decentralised power plants for renewables into the grid, while at the same time the alignment of the national networks to the national territories inhibits co-operation between Member States and effectively impedes the creation of a European internal market for electricity from renewables. This alignment of the networks to the national territories, on the one hand, is also an obstacle for the optimal use of renewables, as renewable resources, on the other hand, are not aligned to political or administrative borders. In a European context, the existing network infrastructure therefore does not allow for taking full advantage of the natural diversity of Europe with its different potentials for renewable energy sources in the individual regions.

The natural diversity is to be seen as an additional potential value in the context that some renewable energy sources are fluctuating resources and in the context of an integrated system (see chapter 2). Having a mix of renewable energy sources available and successfully integrated will improve the conditions to achieve the goal of a full replacement of fossil fuel and nuclear power with renewable energy electricity.

The diversity of Europe's climatic, hydrological and geological conditions is also mirrored by different resource-specific generation costs, depending on the geographical location of the power plant. Cost efficiency will play an increased role within a perspective of the complete shift to renewable energy. Figure 6 shows the range of the technology-specific marginal costs of electricity generation in the EU in 2005. With the further development of the technologies and their market penetration, these marginal costs will generally decrease, but regional differences will stay due to different natural conditions. A European regenerative electricity market would therefore be much more cost-efficient than a strategy attempting to create a 100% green electricity supply based purely on the renewable energy sources available within the national boundaries.

Fig. 6: Range of marginal costs of electricity generation from various technologies in the EU in 2005



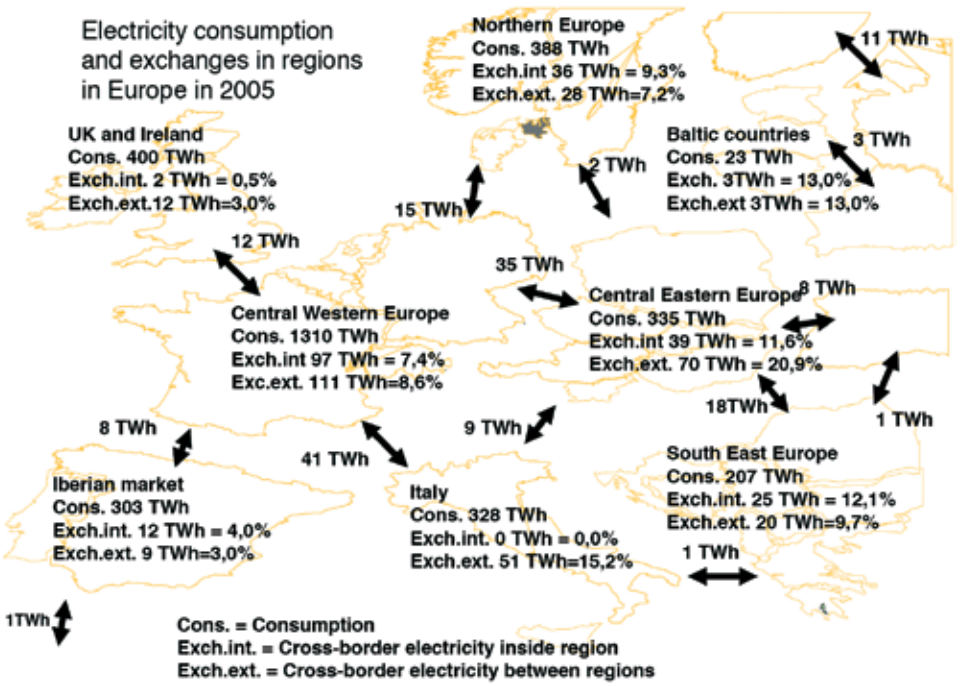
Source: OPTRES

A trans-European electricity network is vital for the better utilisation of the high renewable energy potential, the optimisation of the energy mix and a cost-efficient transition to green electricity. For a rapid growth of the share of regenerative electricity, the question of trans-European trade with green electricity will play an incrementally decisive role. For example, it is assumed in the lead study on "A strategy to increase the use of renewable energy" for Germany (Nitsch 2007) that from the year 2018 onwards, imports through a trans-European electricity network for renewable energy will play an increased role, and that by 2050 such imports could cover 25% of the regenerative electricity demand in Germany.

However, for network operators that are also electricity producers, there are no incentives to invest in interconnections of the transmission grids, since this would allow more competition on the electricity market. This explains why investment in the EU in cross-border infrastructure has previously been extraordinarily low (see

chapter 2.3), and why not even the minimum electricity interconnection capacity of 10%, which was agreed upon in the EU, has been achieved in all Member State. As a result, cross-border electricity trade is very low in the EU (Fig. 7).

Fig. 7: Electricity consumption and exchanges in regions in Europe in 2005



Source: EC 2007c, http://ec.europa.eu/ten/energy/documentation/doc/2007_03_30_ten_e_infoday_presentation_en.pdf

The Commission has therefore come to an alarming conclusion: "If the EU continues on its present infrastructure course, none of the energy policy for Europe objectives will be met. The development of renewable energy sources will be hampered by the lack of network transmission capacities either within or between Member States," (EC 2007b).

To change this situation, the proposals of the Commission in the so-called third internal market package are extremely important. They aim to achieve unbundling of electricity production from network operations, and new arrangements for the co-ordination of network investments and between the regulatory authorities.

Recognising the importance of trans-European networks for a functional internal market, the Member States have long since given the EU the task of contributing to the establishment and development of trans-European networks in the areas of transportation, telecommunications and energy infrastructures (Art. 170 TFEU, ex-Art. 154 TEC). The actions by the EU "shall aim at promoting the interconnection and the interoperability of national networks as well as access to such networks."

A key instrument to meet this task is the Trans-European Networks (TEN) programme, according to which financial support can be granted from the EU budget. However, the amount available for the development of trans-European

energy networks is limited to an annual average of 20 million EUR until 2013. With this amount of money, studies and co-operation can be promoted, but for the co-financing of the technical infrastructure the budget is insufficient. However, according to the Community Strategic Guidelines on Cohesion 2007–2013, the relevant European funds can be used by the Member States also for the improvement of the integrated electricity networks.

Nevertheless, the Commission rightly states that it should be seriously considered whether the current amount of EU financing for the energy policy goals for Europe is sufficient.

For ERENE, of paramount importance is an intelligent trans-European grid which is capable of integrating a large number of diverse, decentralised renewable energy sources and which can enable the creation of a European internal market for renewable energies.

The participating Member States should confer the necessary competencies and financial resources upon ERENE to contribute through direct participation in the construction and operation of interconnectors between Member States and in joint pilot projects toward the development of a trans-European electricity network that is capable of creating a European internal market for green electricity.

This recommendation for a direct involvement in the construction and operation of technical facilities and the infrastructure follows a recent example of EU policy, namely the Galileo project – the European Satellite Navigation System.

Galileo – European Satellite Navigation System
The project is seen as an "indispensable infrastructure investment" for the EU's economy (EC 2007f: 534). After failing to find private investors in the current phase of the project, the EU decided in 2007 to finance the total costs of the satellite navigation system from the EU budget. In the period from 2007–2013, a total of 3.4 billion EUR will be available for financing Galileo up to its full operability. The public financing from the EU budget includes the satellites, the rockets as well as the necessary infrastructure on the ground. The EU is the owner of all assets.

c) Establishment of Joint Undertakings for the Development of Renewable Energies

To meet its tasks, ERENE should have the competency to establish joint undertakings.

The establishment of joint undertakings is provided for in the EURATOM Treaty – for example, ITER – as well as in the Treaty on the Functioning of the EU (the former TEC) – for example, Galileo. Article 187 (ex-Art. 171) of this Treaty states: "The Union may set up joint undertakings or any other structure for the efficient execution of Union research, technological development and demonstration programmes." The Treaty does not contain more detailed provisions, except for stating that these provisions are adopted by the Council with qualified majority voting on a proposal of the Commission and after consulting the EP. Even though the purpose of such a joint

undertaking must be related to research and development, the Galileo example does show how broad this provision can be interpreted. In any case, on that legal base, the EU would have the option to establish a joint undertaking to build and operate demonstration plants for the use of renewables energy sources, including its connection with the grid.

According to the EURATOM Treaty, the establishment of joint undertakings in the area of nuclear energy is not limited to research purposes or demonstration facilities. In general, undertakings which are "of fundamental importance to the development of the nuclear industry in the Community" can also be established as joint undertakings. This status can and is granted also to purely private companies active in the nuclear sector, which may provide them with relevant tax privileges, which can be granted on the basis of the EURATOM Treaty.

ERENE should have the competency to establish joint undertakings for:
- **the construction and operation of demonstration facilities;**
- **the establishment of grid interconnectors between Member States;**
- **the development of smart grids for the connection and system integration of renewable energies.**

Use should be made of this option in case the necessary investments are not provided by the private energy sector. Joint undertakings should have the option to participate in consortia together with private companies. Participation in a company for a trans-European electricity network should also not be excluded. In addition, there should be the option that only some of ERENE's Member States participate in the joint undertaking.

d) Support of Investments in Generating Electricity from Renewable Energy Sources

Even though there has been a heavy drop in the costs of technologies for green electricity production in recent years, while the prices for gas, oil and uranium exploded, there is no level playing for electricity based on renewable energy sources on the one hand – with the general exception of large hydropower plants – and electricity based on fossil fuels or nuclear power on the other hand. This is the result of several distortions of competition.

For instance, prices for products of the carbon economy do not currently include the external costs resulting from Co_2 emissions. The European emissions trading system is an important step towards their internalisation, if the emissions allowances are no longer allocated for free, but auctioned, and their numbers steadily reduced. The price for electricity from nuclear power does not include the de facto inestimable cost of the final storage of the radioactive waste for millennia. In addition, competition on the energy markets is distorted by actors dominating the market, and by various public subsidies in favour of coal-based and nuclear-based electricity production. The European Commission has estimated that state aid granted to the energy sector in the EU-15 in 2001 totalled 15 billion EUR, of which only 19% went to renewable energy. Furthermore, competition is distorted by European law itself, namely the EURATOM Treaty and its promotion of the nuclear industry. Also of importance is the fact that the technical infrastructure for energy supply is one-sided and aligned to the

carbon economy and nuclear power. Together with other conditions, that works as a market entry barrier for undertakings in the renewable energy sector. In addition, the costs for generating electricity from renewable energy sources are dominated by the investment costs for the installations, while the costs for electricity from fossil fuels are mainly determined by the prices for these fuels. For producers of green electricity, the capital risk is therefore concentrated on the risk of investing in the installations. That is why the willingness to invest in renewable energy plants significantly depends on the question of long-term purchase commitments for green electricity.

For all these reasons, support measures for investments in renewable energy are needed to promote their development in order to pursue the objectives of protecting the climate, securing energy supply and strengthening Europe's competitiveness. This is also acknowledged in the Community Guidelines on State Aid for Environmental Protection. Support schemes for renewable energy can balance the existing disadvantages in competition and stimulate their market penetration.

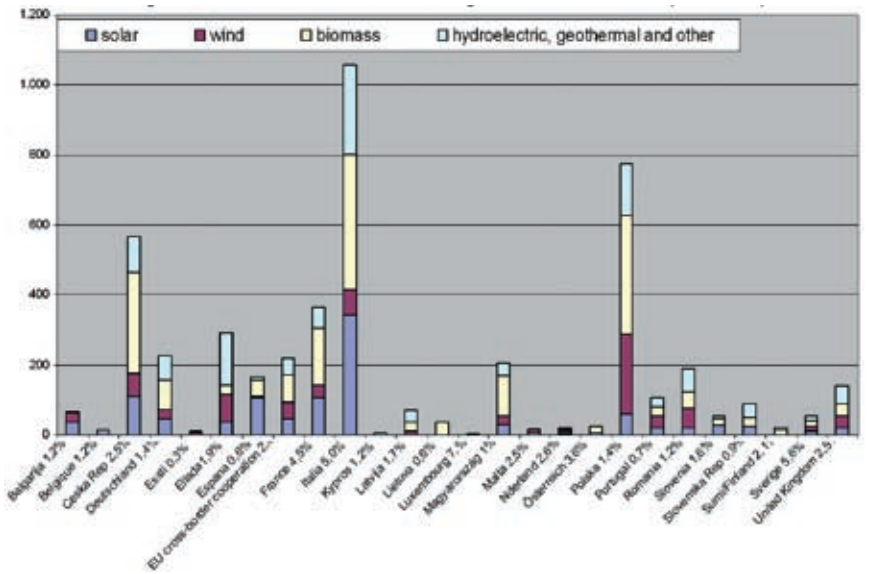
On the national level, state aid may thus be granted by the Member States for promoting investments in renewable energy to the extent that it is compatible with the Community Guidelines on State Aid for Environmental Protection. On the European level, money from the funds for the cohesion policy can be used for energy-related projects. Pursuant to the information from the European Commission (EC 2008c, IP/08/267), the operational programmes for cohesion policy for 2007–2013 submitted by the beneficiary regions include investments totalling 9 billion EUR for energy-related projects, of which 4.8 billion EUR are foreseen for renewable energy, and 4.2 billion EUR for energy efficiency and energy management measures.

The breakdown of the money allocated to projects in regenerative energy by the different renewable energy sources is as follows:

1.8 billion EUR biomass
1.1 billion EUR solar
1.1 billion EUR hydro, geothermic and other sources
0.8 billion EUR wind

In this way, the EU budget is providing an important contribution to regional projects in order to support the Member States in reaching their targets for the share of renewable energy by 2020. It is of particular interest to compare the priorities of the Member States for the projected spending of the funds. Figure 8 shows the absolute amounts from the European Fund for Regional Development (EFRD), which the individual Member States have dedicated in their programmes to renewable energy projects, since the overall amount of funding from the EFRD that each Member State will receive differs considerably due to the eligibility criteria. Figure 8 also highlights the respective share of the total EFRD funds allocated to a Member States that will be spent for renewable energy projects.

Fig. 8: Projected investments of funds from the European Fund for Regional Development in renewable energy (2007-2013; in Mio EUR)



Source: EC 2008c, IP/08/267

Besides the national state-aid for investments and the subsidies financed from EU cohesion policy funds, specific support schemes for electricity from renewable sources are of particular importance. All Member States have put in place such support schemes in recent years – not least triggered by the relevant EU directive of 2001 – in order to provide investors with long-term investment security and compensate for the current higher costs of electricity production from renewable sources. Most of the Member Sates have established price-related support schemes with feed-in tariffs, although there are considerable differences regarding the level of feed-in tariff, the duration of the support and the differentiation between various technologies. However, the same provision applies or will apply to all countries by existing or proposed EU Directives with regard to priority access to the grid for green electricity.

At the request of the Commission, the OPTRES study was carried out comparing the effectiveness and efficiency of the national support systems and examining the effects of an EU-wide harmonisation of these systems. In the comparison of the national systems, the study comes to the conclusion that the price-related support systems – the feed-in tariffs – have advantages compared to the quantity-related systems – the quota-systems – for the supply or the demand of electricity form renewables with respect to effectiveness as well as to cost-efficiency. The analysis also reveals that it is of great importance for the overall technological development to include all electricity-generating technologies from renewable energies in the support scheme. In order to put the most cost-efficient support scheme in place, technology-specific tariffs should be used.

The simulation of a harmonisation of the support schemes at the European level comes to a clear ranking. To achieve a certain development in the production of electricity from renewable sources by 2020, a harmonised technology-specific support

scheme with feed-in tariffs would be the most cost-efficient way. The second-best solution would be with national support schemes that are continually improved via best-practice sharing. The difference in cost-efficiency between these two solutions lies in the fact that with the continuation of national support systems, the cost advantages resulting from different marginal generation costs of green electricity across the EU cannot fully be realised. The most expensive regime for consumers would be a non-technology-specific harmonised support scheme based on quotas, as it would generate high "windfall profits".

For ERENE no harmonisation of the national support schemes for electricity from renewable energies is proposed. The main reason for this is that ERENE is not to be established as an alternative to the legislative package submitted by the Commission in January 2008, according to which Member States must assure the achievement of their individual targets for renewable energy by 2020 through National Action Plans (NAP). ERENE should rather concentrate on joint actions of the participating Member States in order to establish a common market for renewable energy, enabling a sustainable development in electricity supply that goes beyond the target agreed by the entire EU. In this sense the difference between the two approaches can be described as follows: while the NAPs shall promote the creation of stable national markets for renewable energy, the aim of ERENE is oriented towards establishing a stable European market for renewable energy. These developments should not occur in succession, but rather at the same time. Therefore, ERENE should concentrate on the support of cross-border trade in green electricity.

According to the national alignment of the support schemes in Member States, only green electricity energy produced in the national territories is eligible for the support system (with the short-term exception in The Netherlands). This results in there being no incentives to produce green electricity for the transnational European electricity market.

ERENE shall provide a uniform support scheme for cross-border trade in electricity from renewable energy sources between the participating States. A price-related support scheme for imports of renewable electricity in and from the ERENE Member States is proposed with a uniform, but technology-specific premium to be paid to the producer of green electricity for the supply placed on the market of another Member State.

The additional costs of this joint support scheme would be the same for all consumers in the ERENE Community, although the final power prices paid by the consumers will be different, as well as the final price paid to the producers due to the various price levels in the different markets.

To achieve an electricity supply from renewable energy that goes beyond the horizon of the respective draft Directive of 2008, two further provisions for the proposed two-tiered support scheme should be put in place:

Firstly, the producers of green electricity should have the right to choose between the national and the supranational support scheme. They should have the option to be supported according to the national scheme or the joint support scheme of ERENE. Also for the joint support system, there should be a right of priority feed-in of green

electricity. Secondly, the imported green electricity, for which a premium is paid according to the joint support scheme, shall not be counted towards the national binding minimum targets set by the EU Directive. This will underline the aim of ERENE to come to a development beyond these national minimum targets and to use today's timeframe not only for national but for joint efforts to switch to an energy system based on renewable energy sources.

It should be stressed that this is not a proposal on cross-border trade with certificates counting towards the national binding targets, but on physical trade in electricity generated from renewable sources. The option for producers of regenerative electricity to offer their product either on the national market or for cross-border trade may force improvements of the national support schemes to offer sufficient incentives in order to reach the national binding target for the share of renewable energy in final energy consumption levels. This combination of national and ERENE-wide support schemes may be able to stimulate a development creating stable national markets as well as a stable export market for green electricity. Such a combined system will gain importance with the availability of a trans-European grid and with a rising number of Member States integrated in the European grid and joining ERENE.

e) Promotion of a Common Market for Renewable Energy by Reducing Administrative Barriers

The development of renewable energy is not only constrained by distortions in competition and insufficient grid infrastructure, but also by disproportionate administrative procedures and regulations. According to the draft Directive, Member States must assure that these types of barriers and constraints for the use of renewable energy sources are diminished (see chapter 2.3).

ERENE should have the competency to enact administrative regulations, for example concerning the authorisation procedure for permits.

However, there are too few comparative studies and reports available outside of the OPTRES study to propose a harmonisation based on best practice. The action plans that the Member States must submit in the future will enable new insights, as they will also indicate if there is a convergence in the improvement in the procedural and administrative provisions in the Member States, which would make a harmonisation superfluous.

The ERENE Member States should commit themselves to co-operate for the improvement of administrative procedures and provisions for renewable energy and to quickly implement such improvements.

f) Promotion of Co-operation with Third Countries in the Field of Renewable Energy

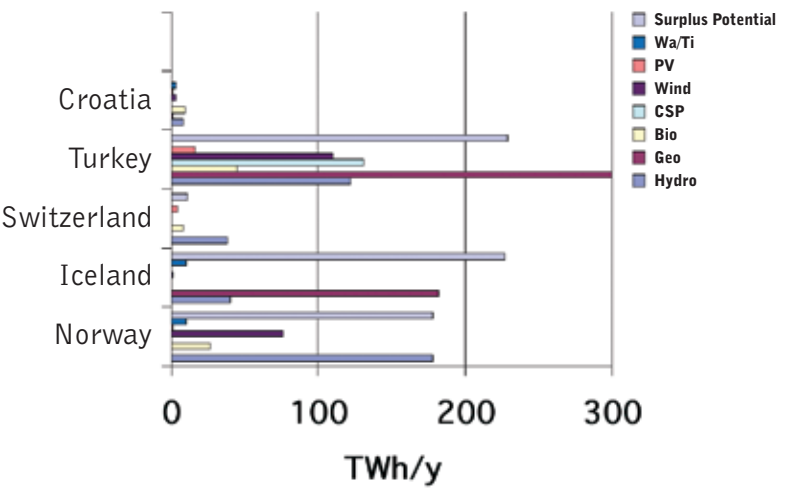
A future-oriented European energy policy must look beyond the borders of the EU. International co-operation is a prerequisite for the chance to mitigate global climate change, and economic co-operation plays a key role in the success story of the EU

to assure good neighbourhood relations and political stability in Europe. ERENE should therefore not only be open to all EU Member States, but also have the right to sign agreements with third countries on co-operation in its field of competency. This should apply with regard to the countries of the European Economic Area (EEA) – Iceland, Norway, Liechtenstein – to Switzerland, to the Candidate Countries – Croatia and Turkey – as well as to the western Balkan States.

Some of the aforementioned countries already cover a significant part of their electricity demand with renewable energy or are even net exporters, with some of them using exclusively hydropower – with the exemption of Iceland. The share of renewable energy in final electricity consumption in 2005 was 36% in Croatia, 25% in Turkey, 100% in Iceland, 108% in Norway and 47% in Switzerland (data: Eurostat).

The DLR study shows that the potential for renewable electricity in the states listed is significant and – as shown in Figure 9 – is currently far from being fully exploited. Norway and Iceland have significant export potential, and in Turkey, too, the economic potential for renewable electricity production exceeds future expectations, in comparison to its significantly rising electricity demand today.

Fig. 9: Potential for electricity from renewable energy sources



Source: GSA 2006

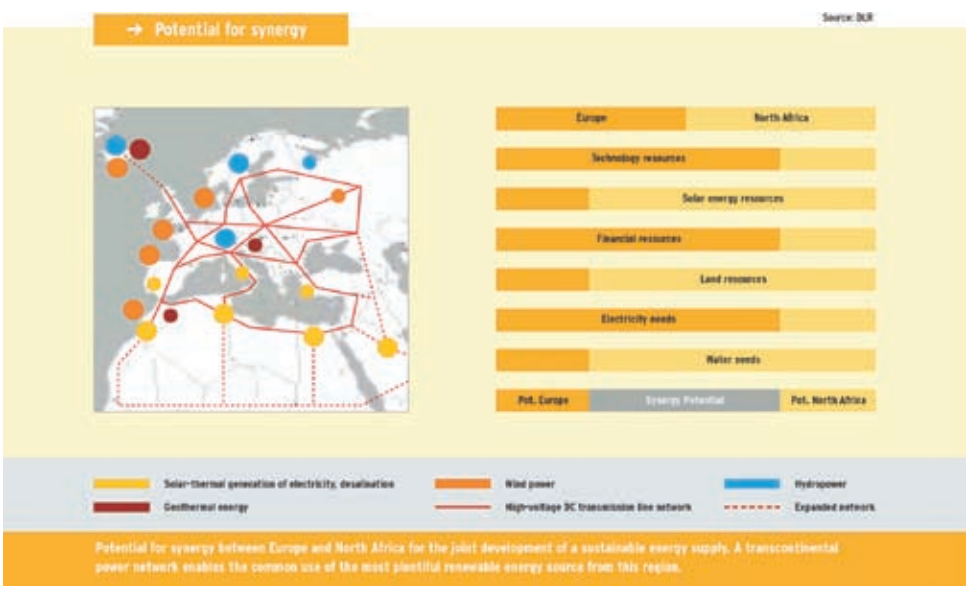
ERENE should also be open to co-operation with third countries in the neighbourhood of the EU. There are concrete proposals for co-operation with the Mediterranean countries with their great potential for concentrated solar power. Proposals on the options and conditions for such a co-operation, which have already been proposed in 2003 by the German Advisory Council on Global Change to the Federal Government (WBGU 2003), are now available in very detailed form and are in the meantime well known under the name "DESERTEC" project. Based on the DLR studies, a scenario has already been designed for an integrated grid between the EU and the non-European Mediterranean states – called EU-MENA. The proposal is to use the high solar energy potential of these states in concentrated solar power plants (CSP) for the coverage of the increased electricity demands of this region, primarily due to the need for seawater desalination plants, as well as for export of electricity to Europe. The electricity from renewable energy should be sent to Europe via HVDC

Transmission (High Voltage Direct Current Transmission), which has relatively low transmission losses also over long distances. Regarding the political preconditions, this co-operation should be enabled by a free trade zone for renewable energy.

This project should also be seen in the context of the offensive for exporting nuclear power plants to North African states, which is supported by France despite the proliferation and technology risks as well as the high investment costs. The DESERTEC project, in contrast, meets the criteria of a sustainable energy policy, and is therefore particularly suitable as a project for EU-Mediterranean co-operation. Such co-operation serves the economic and technological development of the southern neighbouring states of the EU and is also in the political interests of the EU, not only in terms of the climate and energy policy.

The DESERTEC project proposes the import of solar power from the EU-MENA co-operation as a supplement to the use of renewable energy sources on the European continent. The scenario envisaged by the DLR TRANS-CSP study suggests that in 2050, approximately 20% of the EU's electricity demand could be covered by "electricity from the desert". As a result of the favourable climatic conditions for solar energy in the Mediterranean States, this co-operation would have the advantage for the EU of stabilising the supply of electricity generated from renewable sources and of reducing electricity prices due to the low production costs. For the North African states, the advantage lies in technology transfer and in the trade with renewable electricity generated from plants that also serve the African states themselves for drinking water abstraction through seawater desalination.

Fig. 10: Synergy potential



Despite the goal of reducing the EU's energy-import dependency by developing its own domestic energy sources, and despite the fact that the economic potential for renewable energy in the EU, the European Economic Area, and the Candidate Countries is sufficient to fully cover their electricity demand, and despite the advantages of decentralised energy supply compared to the current centralised supply

structures, the economic and political benefits of co-operation like the DESERTEC project should be considered and realised. It is therefore very positive that this project will be taken up for the EU-Mediterranean co-operation within the framework of the European Neighbourhood Policy. ERENE, too, should have the option to make agreements with third countries in order to enhance or concretise co-operation in the area of renewable energy.

The treaty or the decision for establishing ERENE should allow this Community – in co-ordination with the EU – to make agreements with third countries on the co-operation in research, the installation of demonstration facilities, promotion of investment in the production of regenerative electricity and interconnections to the European grid, and on import of green electricity.

3.3 Financing the Activities of ERENE

Climate protection and a sustainable energy policy are two of the political priorities of the EU. However, these priorities are not mirrored in the EU budget.

The overall budget available for energy research was increased in the multi-annual financial framework for the period 2007–2013, agreed by the Council, Parliament and the Commission in 2006, but the major share of this money is still flowing to nuclear research. Financing a development project in renewable energy from the EU budget, with costs similar to the cost of the ITER project, is thus excluded by lack of resources. The "Intelligent Energy – Europe" programme, in which renewable energies are a priority, cannot offset this imbalance with its average annual budget of 104 million EUR.

However, it should be mentioned that Member States can now use money from the EU funds for cohesion policy for funding of infrastructure projects in the energy sector. According to the Commission, Member States intend to spent 4.8 billion EUR from the funds allocated to them in the framework of the cohesion policy in the period up to 2013 for renewable energies projects. The Community programme "Trans-European Networks", on the other hand, will not be able to provide funding for large-scale infrastructure investments due to the limited amount available from an annual average of 20 million EUR dedicated to energy projects.

Sustainable energy also plays an important role in foreign policy funding programmes, for example in the European Neighbourhood Policy Instrument (ENP). The financial resources available allow for funding of some individual projects and initiatives, but for large-scale investments in energy infrastructure, the EU can only offer the lending capabilities of the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD).

When the heads of state and government determined their positions in 2005 on the EU's multi-annual financial framework for the period up to 2013, they could not agree on a higher Community budget for joint measures in the energy sector – as the Commission has proposed for Trans-European Networks or for research. This reluctance is surprising when considering the determination in other policy areas with which the EU in the past and today has tried to achieve common goals through spending considerable amounts of public money. Reference to EURATOM has already been made in this context. Since its foundation, EURATOM has been granted signifi-

cant financial resources. Another example is agricultural policy, to which significant resources are allocated in order to assure common goals. The former price-related intervention system in agriculture, which provided the farmers with take-off guarantees for their products at a minimum price, shows some similarities to the support system of feed-in tariffs for electricity generated from renewable energy; although due to the specific conditions in the agriculture sector, the subsidies were not directly passed on to consumer prices, but ran through the public budget. In agricultural policy, the purpose of the subsidies was to boost production through financial incentives and income security for the producers in order to guarantee the security of food supply for the population in the EU through domestic production that covers all European demand. This objective continues to play an important role for the political legitimacy of agricultural subsidies.

How can one explain the hesitation of the Member States to provide more financial resources for a sustainable European energy policy – and in particular for the promotion of the use of renewable energy sources – which shall play an important role for security of energy supply in the EU?

One reason is that the decision on the multi-annual financial framework of the EU requires consensus in the European Council. That is the reason why the acceptance of financial support for new policy areas and a change in the priorities of EU expenditure comes only step by step. Even the change of the current multi-annual financial framework in order to finance the total cost of the Galileo Project from the EU budget, which was decided at the end of 2007, would have failed if the EP had not successfully negotiated that a qualified majority in the Council is sufficient for a revision of the financial framework in the case that this revision does not exceed a certain amount. In the coming years, it will not be excluded to use this revision clause for the financial framework once again to the advantage of funding common measures at the EU level to promote the development of renewable energy.

The hesitation to provide more financial resources from the EU budget for joint actions in the energy area is also an indicator that many Member States consider energy policy still to be a matter of the national policy domain – with the exception of issues covered by ECSC or EURATOM. It is only the Treaty of Lisbon that will provide a specific legal base for a European energy policy, while in the past, common actions of the EU concerning energy were legally based on the EU's competencies in environmental policy and for the internal market.

A further aspect should be mentioned in that context: the principle of "juste retour". According this principle, Member States try "to get their money back", which means that they try to receive the same amount of money from the EU budget as they have paid to the budget. In this view, the benefits which the EU as a whole and the individual Members States gain from EU policies are neglected, or at least underestimated, because benefits are defined in an accounting exercise only in terms of money that beneficiaries in the individual countries receive from the EU budget. Even the aspect of higher cost-efficiency of common action is systematically underestimated in this view.

Can it be expected that those Member States that wish to achieve a sustainable energy supply faster than is currently envisaged, through common action and co-operation, for the use of the manifold potential of renewable energy sources in Europe

think any differently? Hardly. Therefore, ERENE should take up the aspect of "juste retour" or "allocated return" in a positive way for setting up the regime of financing ERENE's activities.

An example of a financing mechanism, in which the principle of "geographical return" applies for funding activities, is the European Space Agency.

ESA

The European Space Agency (ESA) was established by a Convention in 1975. Not all EU (then EEC) Member States signed the Convention, and not all ESA parties are Member States of the EU (Norway, Switzerland). Thus ESA is not based on EU treaties and is not an organisation of the EU, but an international organisation based on a convention. ESA is a legal entity and owner of the assets. It is granted tax privileges in all ESA Member States. ESA's activities are divided into mandatory activities – such as research – and optional programmes, which include, for example, the development, construction and operation of rockets and satellites. In the optional programmes, not all ESA Member States are involved, but only those interested in the programme. The expenditures are financed by contributions from the ESA Member States and levied proportionally to their national incomes. New Member States must pay a special contribution in accordance to the capital value of ESA when joining the organisation. For contracting the optional programmes, the Agency shall apply the principle of "geographical return", according to which, for each individual participating Member State the percentage share of the total value of all contracts awarded among all countries shall be equal to its share in total contributions for the financing of the optional programmes. The geographical total return coefficient should ideally be 1 for each of the participating Member States. Because this cannot always be assured, there is a minimum of 0.8. For the purpose of calculating the return coefficients, weighting factors are applied to the value of the contracts according to their technological importance. In 2006 ESA had 1,900 staff and expenditures amounted to 2.9 billion EUR – of which 2.58 billion EUR were financed by contributions from its Member States, 734 million EUR of which were used for mandatory activities and 1.78 billion EUR for optional programmes.

The following mechanism is proposed for financing of ERENE's activities:

Expenditures of ERENE will be financed by the participating Member States. The financing shall be based on the revenue from the European Emissions Trading System (EU ETS). The financing share of the individual Member States will be calculated on the basis of its share in total revenue from the ETS.

In the draft Directive to improve the greenhouse gas emissions-allowances trading-system of January 2008, the European Commission proposed that the revenue generated through auctioning the emission allowances – which shall be fully obligatory as of 2013 – will flow into the public budgets of the Member States. It will be obligatory for only 20% of these proceeds to be used for the financing of measures designed to advance a sustainable energy policy. The total amount of revenue from auctioning the allowances are estimated at 75 billion EUR for 2020 if additional economic sectors are

included in the ETS. This amount represents some 0.5% of the EU's gross domestic product and corresponds to half of the current EU budget.

The proposal that the revenue from the ETS will go to the Member States' budgets and not to the Community budget can be viewed critically, given the fact that this financial resource was created by European common policy – namely the establishment of a new market for emission certificates. These financial resources are in this sense European ones, similar to customs duties, and is assigned to the EU as its own resource. In addition, the correlation between the revenue a country gains from the ETS and the amount of its given emissions allowances, despite some corrections in the Commissions' proposal, is not without problems regarding aspects of environment and justice. Various aspects, therefore, call for the common use of at least a part of these revenues.

For all these reasons it is proposed in this study to use a part of the revenues from the emissions trading system as a resource for funding the activities of ERENE, not in the sense of ERENE's own exclusive resource, but a resource resulting from the Member States' contributions. An additional reason for this funding proposal is the consideration that the revenue from the ETS is a new financial resource assigned to the Member States and that, therefore, the contributions to the ERENE budget will not draw from the national public budgets, which might enhance the political feasibility of the proposal. Last but not least, as the revenues from the emissions trading system will increase over time, it might improve the chances of increasing resources dedicated to ERENE activities.

The distribution of funding among the participating Member States should correspond to the distribution of revenue generated through auctioning of the emissions allowances. In principle, the same percentage should be levied on the revenue from the ETS in all Member States of ERENE. However, the redistributional element in the Commission's proposal in favour of the less prosperous Member Sates should be taken into account.

In addition, the principle of "geographical return" is proposed to be applied in the financial regime for ERENE:

Expenditure of ERENE shall be differentiated into mandatory expenditure – for general research activities on renewable energy – and for optional programmes. The principle of "geographical return" shall apply to the optional programmes. The optional programmes include investments in demonstration plants and network access and interconnections. The awarding of contracts as well as the location of the investments should be included in the calculation of the "geographical return". Accordingly, the value of a facility would be (partially) assigned to the country on whose territory the facility is established. For balancing the return coefficients among Member States with a positive and those with a negative coefficient, buying options for electricity generated from renewable energy should be introduced.

Calculating the return coefficients, the value of fixed assets – for example, demonstration plants – should be allocated to the country where the facility is located because it will later be given over to the ownership of that country. As it would be rather unwise to come to a decision on facility locations or the awarding of contracts solely based on the criterion of a return quota of 1 for all participating states, buying options for green

electricity should be introduced in order to ensure a balancing of return coefficients between the states. Countries whose return quota is less than 1 would receive buying options for regenerative electricity from countries with return quotas exceeding 1, whereby the exporting countries could, for example, balance out return quotas financially by paying the proposed premium for regenerative-electricity cross-border trade. Through such buying options, the advantage of, for example, ERENE's investments in a trans-European grid for green electricity would also benefit countries that neither had companies involved in ERENE contracts nor ERENE facilities on their national territories.

Such a mechanism of "geographical return" could assure the interests of many Member States in helping to decide to join ERENE – it may be that they have strongly competitive companies in the business area of renewable energy or that a demonstration plant for generating green electricity is built on their territory, which otherwise would have needed national funding, or that they are interested in the buying option for green electricity.

3.4 Legal and Institutional Basis of ERENE

In principle it would be best if ERENE becomes a big and visionary project of the EU as a whole, with all Member States sharing the goal of realising the technological, economic and ecologically feasible switch from fossil and nuclear fuels to electricity generated from renewable energy sources, and to provide the necessary conditions for this change. Can the EU take a decision to establish ERENE as a new common project for the EU as a whole on the basis of the treaties on which the EU is founded and in the new version of the Lisbon Treaty?

In principle, yes, because the Treaty of Lisbon includes, for the first time, a special chapter on energy policy, by which competencies in this policy field are conferred upon the EU (Article 194 TFEU). This new chapter is very relevant for European energy policy. Besides the provisions in the special treaties ECSC and EURATOM, it is now also accepted in the general Treaty, on which the EU is founded, that energy policy is no longer a political domain only of the nation-state, but that competencies on the supranational level are also needed to take common action.

The new provisions on energy policy are added to those on environmental policy, which, until the Treaty of Lisbon, served as the legal basis for directives in the area of renewable energy (Article 192 TFEU (ex-Article 175)).

According to the new article in the Lisbon Treaty, "Union policy on energy shall aim, in a spirit of solidarity between Member States, to:

- Ensure the functioning of the energy market;
- Ensure security of energy supply in the Union;
- Promote energy efficiency and energy savings and the development of new and renewable forms of energy;
- Promote the interconnection of energy networks."

These objectives are very similar to those of ERENE. Therefore, it would be conceivable to establish ERENE as a new, large Community project for the entire EU.

However, considering ERENE's ambition to increasingly and, ultimately, completely replace fossil and nuclear fuels with renewable energy sources, a further

provision of the Treaty must be taken into account. According to the Treaty provisions, action taken on the EU level shall not affect the right of a Member State to choose between different energy sources and determine the composition of its energy mix (Article 194, par 2 TFEU). For such European measures that significantly affect the energy mix, unanimity vote in the Council is required (Article 192, par 2 TFEU, ex-Article 175, par 2 TEC). In its legislative proposal of January 2008 on setting the 20% renewable energy target, the Commission argues that this target will not significantly affect the energy mix. Therefore, the proposal is based on Article 174, par. 1 TEC, according to which qualified majority voting in the Council is sufficient and the EP is involved by co-decision procedure. However, since ERENE has the explicit goal of changing the energy mix for electricity generation completely towards renewable energy, unanimity in the Council will be required to take the relevant decisions.

It can, however, hardly be assumed that all Member States would be able to agree on a further target for renewable energy, in the short-term after they have managed to agree on the legislative package proposed by the Commission in January 2008 after difficult negotiations. That is why it should be considered on which legal and institutional basis ERENE could be established as a partial Community of the EU, as an avant garde in European energy policy.

Two options will be discussed:

a) Establishing ERENE on the basis of the existing treaties as a project of enhanced co-operation between some of the Member States of the EU;
b) Establishing ERENE on the basis of a new, separate treaty. ERENE would then be a new Community existing alongside the EU and EURATOM.

A third way, namely converting the EURATOM Treaty into an ERENE treaty, is currently not a realistic option, because this would require consensus of all Member States to abandon nuclear power, and this change could only come into force after ratification by all Member States. Another way, the integration of the ERENE idea into the EURATOM Treaty, presupposes a consensus on a co-existence of nuclear power and renewable energy as a long-term perspective. This consensus, too, will not be achieved and such an option would also contradict the essential objectives of ERENE.

The following questions will be discussed in order to evaluate the two options for the establishment of ERENE:

- Which legal options exist for the establishment of a Community to which not all EU Member States belong?
- Can the EU institutions be used for this new Community?
- Can ERENE be provided with the necessary instruments to meet its tasks?
- Is democratic control ensured?
- Which procedures, with their corresponding advantages and disadvantages, can be used for establishing ERENE?

a) ERENE as a Community for Enhanced Co-operation within the EU

The establishment of ERENE as an EU project based on current EU treaties must not necessarily fail for the reason that unanimity in the Council is required for taking

decisions that significantly change the energy mix. For cases where a political goal cannot be achieved "within a reasonable period" by the EU as a whole, the TEU provides the option to establish "enhanced co-operation" between some of the Member States as a last resort (Article 20 TEU). This option exists for political areas which do not fall under the exclusive competency of the EU, such as energy policy. To establish an "enhanced co-operation", the following conditions must be met:

- A minimum number of nine Member States must participate;
- The enhanced co-operation shall be open at any time to all Member States;
- Enhanced co-operation shall not undermine the internal market or the economic, social and territorial cohesion of the Union (Article 326 TFEU).

As ERENE is striving for a common market for renewable energy and for more co-operation between Member States in the energy sector, and as it shall try to include as many Member States as possible, there is no impediment seen in these conditions for establishing ERENE within the EU as a Community for enhanced co-operation. Establishing ERENE on such a basis would stress its aim of deepening the political integration in Europe.

In case of establishing ERENE as such a Community of enhanced co-operation, use can be made of the EU institutions (Article 10 TEU). No new institutions need to be established, although an agency for executing ERENE's tasks and supporting the European Commission could be set up.

All provisions of the EU treaties on the competencies of the EU, the goals and tasks in the individual political areas and the decision-making procedures would apply to ERENE in the case where ERENE is established as a group for enhanced co-operation. Would this limit the scope of possible activities of ERENE compared to the tasks and instruments proposed in chapter 3? This might not be the case, since the new Treaty provisions on energy policy related to the internal energy market, security of supply, interconnection of networks, etc., are very broadly defined, and examples like Galileo show that the legal base of the TEC allows for establishing joint undertakings for the construction and operation of new technology facilities – to mention only one example of the proposed activities of ERENE. Neither would the proposed common premium system for regenerative electricity-trade between Member States infringe upon the internal market rules, as national support systems for renewable energy that apply only to green electricity generated on the national territory are also not seen as infringements.

According to the Treaty (TFEU), the expenditures resulting from activities of enhanced co-operation shall be borne by the participating Member States – with the exception of the administrative costs resulting from using the EU institutions. There is no further elaboration in the Treaty whether the administrative costs would fall within the EU budget, but it can be assumed that this is the intention of the provision. The Council can unanimously decide otherwise.

Neither the financial resource and the distribution key of burden-sharing for the operative costs resulting from enhanced co-operation, nor the applying of decision-making procedures is ruled out in the Treaty. As these expenditures are not expenditures of the EU, the Treaty provisions for the EU budget do not apply – unless the Council decides this with unanimity and the approval of the EP. From this it follows that the participating Member States would be free to decide on its own financing mechanism. The financing mechanism for ERENE, proposed in this study, would

be an option. However, it should be emphasised that there is so far no experience with the mentioned provisions for enhanced co-operation. Also, with regard to the questions of financing, the EU institutions must find a common understanding of the new Treaty provisions.

Regarding democratic control by the Parliament and its participation in the decision-making, all general provisions of the EU treaties apply to enhanced co-operation. The involvement of the EP in decisions concerning ERENE's activities would accordingly be ensured. However, two aspects are particularly noteworthy:

Firstly, as noted above, for decisions on measures significantly affecting the energy mix, the Treaty calls for unanimity in the Council, with the EP only playing a consultative role. This provision also applies to enhanced co-operation. Therefore, for decisions on activities of ERENE, unanimity in the Council would be required – although between the participating Member States only – and the EP would only be consulted. The participating Member States could, however, unanimously decide to use the ordinary legislative procedure with co-decision of the EP and qualified majority voting in the Council.

Secondly, the following difficult rule also applies: While in the Council, only the Member States participating in the enhanced co-operation have a vote; in the Parliament, all members are entitled to vote on the issues of enhanced co-operation. Therefore, if decisions are to be taken in a co-decision procedure and only a few Member States are participating in the enhanced co-operation, it is questionable whether the majority in the EP could be achieved. Therefore, it is very unlikely that the Member States participating in enhanced co-operation would make use of the "passarelle" clause, according to which they can opt for the ordinary legislative procedure instead of the specific procedure with unanimity in the Council and only a consultative role of the EP.

In the Convention for the Future of Europe, which drafted the Treaty establishing a Constitution for Europe, the question was intensively discussed whether in analogy to the Council, only those members should have a vote in the EP on matters regarding enhanced co-operation who were elected in the participating Member States. The EP members in the Convention have declined this for the important reason of legal unity and because the EP is not an assembly of national parliamentarians at the EU level. Enhanced co-operation shall be limited also through this difficulty and be used only as the last resort out of situations in which any progress in European politics is blocked due to the unanimity requirement in the Council.

In order to establish ERENE as a project of enhanced co-operation, the interested Member States would have to address a request to the Commission. ERENE could then be established in accordance with the provisions of Article 329 TFEU by the authorisation granted by the Council to the proposal of the Commission and after obtaining the consent of the EP.

In summary, it can be concluded that establishing ERENE as a Community of enhanced co-operation would have the following advantages: that no new primary legal basis would have to be created, that the existing European institutions could be used and that the involvement of the EP in the decisions-making process is defined by the EU treaties. The asymmetry in the decision-making procedures resulting from the provision that in the Council only the Member States participating in enhanced co-operation have a vote – while in the EP all Members are entitled to vote – could

create specific problems. Regarding the tasks of ERENE and the instruments at its disposal, some restrictions could follow from the EU treaties, however not for its core activities. An important advantage of this option is that it would make clear that ERENE is a new integration project and not an alternative to EU policy. On the other hand, it is a political disadvantage that establishing ERENE in this way would be less visible than setting up a new Community based on a new treaty.

b) ERENE as a New Community based on a New Treaty

In principle, each EU Member State is free to make bilateral or multilateral agreements with other Member Sates for intergovernmental co-operation. It can also set up an organisation with other Member States or with third countries, upon which they can confer responsibilities to achieve political objectives which cannot or not sufficiently be realised by EU policies on the basis of the current EU treaties. This option was taken, for example, in 1975 with the establishment of the European Space Agency (ESA). Thus, ERENE could also be established on the basis of a new treaty.

While the creation of new institutions could certainly be determined in such a treaty, it is harder to say whether the new Community could make use of the existing EU institutions. For each of the Communities, the ECSC, EURATOM as well as for the EEC, separate institutions were created in the founding years. With the fusion Treaty of 1965, these separate institutions were then integrated. Thus, the activities of EURATOM are still today decided and administered through the EU institutions. In this context, it should be reiterated that all EU Member States are also members of EURATOM. Nevertheless, it seems not to be ruled out that ERENE – as a Community that would initially not include all EU Member States – could make use of the EU institutions. This would, however, require the approval of both the institutions themselves and the individual Member States. It could also be determined that – similar to the provisions for enhanced co-operation – only the participating Member States would be entitled to vote in the Council, but that all Council members could have a consultative role. Theoretically, it is also conceivable for the EP to meet as a parliamentary assembly for ERENE, composed only of EP members elected in the countries which joined ERENE. It should be mentioned that this could change the majority in the assembly due to the principle of degressive proportionality, which applies to the composition of the EP. Whether the EP would generally accept such a provision cannot be answered here.

In any case, a new treaty for the establishment of ERENE should – in contrast to EURATOM – provide for full parliamentary control and involvement in the decisions.

An important advantage of establishing ERENE through an individual treaty would be that the participating Member States would be free in defining the tasks of ERENE, in conferring the relevant responsibilities upon it and in providing it with the necessary instruments and means to meet its tasks, including granting ownership rights to the Community and the resources for the financing of joint actions.

Some kind of a convention on energy policy could be convened for the elaboration of a draft treaty for ERENE. After agreement on the treaty by the participating Member States, a ratification process in these countries must follow. There could be the provision from the outset in the ERENE treaty that, in the event of failure of

the ratification in one State, the other States could still establish the Community for Renewable Energy.

The establishment of ERENE based on an independent treaty would probably take more time than through a project for enhanced co-operation. However, such a process would not only ensure a higher level of visibility, but could also give momentum to political mobilisation with in-depth debates in the political arena, and in particular in the public, on the pros and cons of joining such a Community shaping the future.

Both options for the establishment of ERENE are possible and each has relative advantages and disadvantages. The establishment as a project of enhanced co-operation clearly emphasises that this is a new, large integration project for the EU, even if not all Member States would initially belong to it – a situation comparable to the Monetary Union. Establishment of ERENE as a new Community based on its own treaty would be a stronger symbolic political signal that the Community is moving out of the fossil and nuclear fuels era, marked by the ECSC and EURATOM, towards the use of renewable energy. That would make obvious that the Member States of ERENE – more than 50 years since the founding of the first European Community again, but with new joint efforts – are dedicated to the objective of ensuring an environmentally friendly and secure energy supply for Europe.

4
A Roadmap for ERENE

Which steps should be taken in order to establish a European Community for Renewable Energy as Europe's new big integration project? Which questions need further clarifications and which alternatives should be discussed? Who are the actors able to set this idea on the European political agenda, to prepare decisions and who can ultimately take the decision for establishing such a Community? And what is the conceivable schedule?

a) Consultation Process, Open Questions, Need for Clarification and Discussion

Without a doubt the EU possesses the potential to cover its energy needs increasingly from its domestic renewable energy sources due to its geological, climatic and hydrological diversity. The available analyses and estimates also make it clear that the concrete objective of ERENE to move towards supplying electricity primarily from renewable sources is not a utopia, but an attainable vision. This is even more the case if the current Candidate States, the members of the EEA and Switzerland are included in the project and if the option of importing green power from third countries, such as solar energy from North Africa, is considered.

However, the potential for electricity from wind, solar, geothermal, and hydro power, as well as from biomass, is unequally spread across the different regions in Europe. Therefore, in a purely national approach, some states will use only parts of their potential, because that will already be sufficient to cover their electricity demand. For other states, there will be the situation that they cannot fully utilise their entire renewable energy potential, because of the fluctuating character of the energy source – such as wind power. That may set limits to the conversion strategy from fossil and nuclear power to electricity from renewable energy sources. In other states, the economic potential for electricity from domestic renewable energy sources will not be sufficient to completely cover the electricity demand. However, a comprehensive common approach can achieve other results: Following from the diversity of the sources, the mix of renewables can be optimised and also the renewable energy potential can be better exploited. As the boundaries of political and administrative entities are not ordinarily congruent with either the spatial distribution of renewable energy sources or an optimal resource mix, co-operation offers economic and ecological advantages. The ERENE project has the task of realising these advantages of a common approach compared to purely national strategies.

In the EU, the national targets for the share of renewable energies, proposed in the draft Directive, will be negotiated in 2008, and their achievement must be ensured by 2020 via National Action Plans. It is desirable that the decision on the Directive will be taken at the beginning of 2009 at the latest. Undesirable would be, however, that

the Member States direct their actions exclusively to achieving their minimum targets by 2020, and do not include an additional long-term perspective in their strategy planning. An advanced conversion of electricity production to renewable energy beyond the targets of the Directive should not be limited by national boundaries or to the use of renewable sources on the national territories alone, as a pan-European approach will open up new chances and opportunities.

Therefore, the economic and technical questions of a common approach should be further clarified and discussed so that individual countries can ascertain how the regenerative electricity potential can be utilised beyond the minimum targets through co-operation and joint action. Such questions include: Which investment decisions would be promotive, which obstructive to co-operation and which opportunities could ERENE provide for the individual countries? For some of these questions, detailed analysis is available which refer to the EU as a whole. Other questions should be clarified by studies dealing with the Community, others through analysis at a national level.

A second area for deeper analysis and discussion concerns the tasks, competencies and instruments proposed for ERENE in this study. Are they sufficient? Are they the right instruments to support Europe's transition to green electricity in an effective and efficient manner? Should, for example, the national support schemes for regenerative electricity be supplemented by a premium system for trade with green electricity between the States? Or is a harmonisation of feed-in tariffs to be favoured on the basis of best practice? What are the preconditions for an internal market for green electricity? Is it sufficient for ERENE to plan and co-finance the construction of interconnectors in order to achieve a Europe-wide integrated network? Or should a European grid company be set up that would also be responsible for the construction of high-voltage direct-current transmission lines between North Africa and the EU in order to accelerate the transition from coal and nuclear energy to green energy through the import of "power from the deserts"? In this context, an impact assessment would be a useful approach in order to determine the most effective and most efficient instruments for ERENE.

Which institutional form should ERENE take, and what should be its legal basis? Both options – either establishment as a project of enhanced co-operation within the EU or establishment as a new Community based on its own treaty – require further discussions that consider both political and legal aspects. If established as a project of enhanced co-operation, it should be clarified whether from the provisions of the treaties some legal limitations of ERENE's options for future action could follow. Each option sends out different signals, which are of political relevance. The establishment of a new Community based on its own treaty analogous to EURATOM would emphasise that the future does not belong to a Community for the nuclear industry, but rather to renewable energy. While ERENE as a project of enhanced co-operation would instead send the message that the EU has embarked on a new integration project. ERENE's visibility would not necessarily suffer from the fact that no new treaty is created, just as the Monetary Union is not lacking in visibility because it is founded on the basis of the existing European treaties. The question of which option will be taken should, however, not be seen as an ideological one, as the two options are also not irreconcilably opposed. The path that is to be chosen should be the one with the greatest chance of realisation.

The present study represents a kind of Green Paper for the proposal of the ERENE project. Therefore, the roadmap for ERENE should provide, as the first step, an open consultation process on the proposal.

b) Agenda Setting, Decision Preparation, Actors

How can the proposal for the establishment of ERENE be put on the EU's political agenda? The level of acceptance of such a policy and the expectations of the population towards the EU are both of great importance in this context.

Eurobarometer surveys show that renewable energy is overwhelmingly supported by the EU population. Approval of a further expansion of renewable energies ranges from 94% in Ireland to 50% in Latvia (survey carried out in February 2007). Rejection of an expansion of nuclear power is also unequivocal, with 61% of those persons questioned in the EU wishing the share of nuclear power to be reduced. Only in Bulgaria and the Czech Republic are more people in favour of an increase than of a reduction in the share of nuclear energy. At the same time, the majority believes the most suitable approach to energy issues to be a common EU strategy instead of separate national strategies. Approval of this course of action is the lowest in the Czech Republic and the highest in Spain. It can therefore be assumed that ERENE would enjoy a chorus of approval in wide sections of the EU population.

EU citizens will soon have the opportunity to put proposals on the agenda of the European Commission through the Treaty of Lisbon. The new instrument of a "Citizens' Initiative" can, with 1 million signatures , ask the European Commission to put forth a draft proposal for measures in a particular policy field (i.e., energy). It is to be expected that the Council and the Parliament will decide the necessary regulation on the citizens' initiative – ruling out details, for example, on the question of how many Member States the supporters must come from – very soon after the Lisbon Treaty comes into force. In this context, it may be possible to bring a Citizens' Initiative in support of ERENE as early as 2009.

Civil society is an influential actor for agenda-setting on the EU level. Support of the ERENE proposal, in particular by organisations that are dedicated to similar ideas and call for more joint action on the EU level to promote renewable energy, would be an important step in bringing the proposal into the political decision-making arena. The consultation should therefore focus particularly on including these actors.

In the decision procedure on the establishment of ERENE, all three European institutions would be involved: the Council, the Parliament and the Commission. The decision procedure and the involvement of the EP would, however, be different for each of the two options for the establishment of ERENE.

National parliaments are also important actors for the realisation of the project – on one hand by the control of their governments, and on the other by the new clause on subsidiarity control in the Lisbon Treaty. Above all, a new separate treaty for the establishment of a new Community would require ratification in each of the participating Member States, and thus the national parliaments would ultimately decide whether a country belongs to ERENE or not.

All three European institutions – the Council, EP and Commission – can put ideas on the European political agenda. Irrespective of the question of formal initiative rights, the EP has various ways of bringing an issue into the European debate. For

ERENE as a pan-European project, it would be very supportive if it were taken up by a European political party and promoted in the electoral campaign for the next European parliamentary elections in June 2009 as a project for the next legislative period.

As it is the task of the European Commission to promote European integration and to take initiatives for new European political actions – if joint actions are more effective and efficient than individual actions on the national level – the Commission has already announced further proposals for the promotion of renewable energy, supplementary to the climate and energy package submitted in January 2008. For the various reasons addressed in chapter 3, these proposals will most likely not be as far-reaching as the measures proposed for ERENE and will thus not visualise as strongly a visionary common goal. Nevertheless, it is certain that energy and climate protection will remain on top of the Commission's agenda, providing opportunities to discuss the ERENE project in the political and public arenas, thus preparing the establishment of ERENE. The Commission could then submit a proposal in the next term which would ultimately lead to the establishment of ERENE as a project of enhanced co-operation.

As the Council plays the key role in both options for the establishment of ERENE, it is imperative to find Member States that will promote the proposal. After achieving an agreement on the Directive for the promotion of the use of renewable energy sources, some Member States may not be ready to take further steps, whereas it should not be speculated here which Member State might take what position. Thus, it is important to make obvious the advantages resulting from ERENE and to demonstrate that joint action is in the national interest of the Member States. ERENE offers new export chances on the European electricity market for those countries that have an excess potential for renewable electricity due to their natural conditions. For other countries it offers the chance of using their own renewable energy sources to a larger extent than in a national strategy because, with an integrated joint grid, the fluctuations in the energy supply from renewable sources can better be balanced. For countries with high technological capabilities in the area of renewable energy, ERENE will create new market opportunities, and will offer countries with high dependency on imports from third-party states a greater degree of supply-security through European solidarity. All countries will benefit because CO_2 emissions will be reduced, the risk-prone nuclear power will become superfluous, supply security will be strengthened and renewable energy will, as is partly the case already, in the long-term, be a much cheaper source of energy.

In order to increase the likelihood that a proposal will be approved in the Council, it is particularly important that a Council Presidency assumes "ownership" of the proposal and make it a central project of its Presidency. Looking at the calendar of the Council Presidencies, it quickly becomes clear that the first half of 2010 – when Spain will have the Presidency – should be an essential step of the roadmap for ERENE. Spain has successfully promoted an expansion of the use of renewable energy for some years now. The country has a significant renewable energy potential – particularly from solar-thermal energy plants – by which Spain could become an exporter of green electricity if a European integrated grid were to be established. Spain is passionate about Europe and has prior experience of running a successful Council Presidency.

Therefore, the schedule for ERENE should aim to take a decision for the establishment of ERENE in the first six months of 2010.

c) The Schedule

A change in climate and energy policy is urgently needed. The IPCC report leaves no doubt about that. The growing demand for energy and the rapidly increasing price of fossil energies make the search for alternatives imperative. Nuclear power is unsuitable as a result of the risks involved and unresolved questions of final disposal of the nuclear waste. Energy efficiency, energy savings and renewable energy are the three necessary pillars of a sustainable energy policy. The use of renewable energy sources must be massively enhanced. There is no time to move step-by-step. The EU cannot wait until the national minimum targets for the use of renewable energy sources have been achieved by 2020 before it takes further steps to develop Europe's potential for renewable energy through the expansion of an internal energy market.

In addition, many investment decisions for the renewal and expansion of power plants are to be made now and in the coming years, and the Member States have to draft their National Action Plans for the expansion of renewable energy in the near future. The focus should not, therefore, be exclusively on 2020, nor should it be limited to the national sphere. Instead, it should now include the expanded opportunities that a Community for Renewable Energy has to offer.

2008 should be used for consultations – in discussions and with the electronic media – on the proposal for the establishment of ERENE. The UN Climate Conference in December 2008 in Poznan is an important date in this context.

In the first six months of 2009, the European parliamentary elections offer a good opportunity to introduce the proposal into the public sphere.

After the Treaty of Lisbon comes into force, the new "Citizens' Initiative" could help to put the proposal on the agenda of the Commission. The proposal could be further developed at both the national and European levels during the second half of 2009. Of particular importance in this regard will be the UN Climate Conference in Copenhagen at the end of that year.

At the beginning of 2010, a mandate for the preparation of the establishment of ERENE could be established under the Spanish Council Presidency – either for the drafting of a new treaty or deciding on a project of enhanced co-operation in the EU.

Then, in 2010, 60 years after the Schuman Plan, which resulted in the establishment of the first European Community – the ECSC – the historic decision could be made to establish ERENE, the European Community for Renewable Energy.

APPENDIX 1

Table 5: Energy import dependency 2005 in %

BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR
79.6	47.1	27.4	-51.6	61.6	25.8	89.5	68.5	81.2	51.6
IT	CY	LV	LT	LU	HU	MT	NL	AT	PL
84.4	100.7	56.1	58.4	98.0	62.9		37.8	71.8	18.0
PT	RO	SI	SK	FI	SE	UK	EU-27	EU-25	
88.2	27.4	52.2	64.6	54.7	37.2	13.8	52.4	53.0	
HR	TR		IS	NO	CH				
58.8	71.9		28.8	-609.1	60.3				

Definition: Import dependency = Net imports/gross domestic energy consumption. Nuclear energy is counted as domestic energy production in this statistic.

Source: Eurostat, Pocket book "Energy and Transport in Figures" 2007,
http://ec.europa.eu/dgs/energy_transport/figures/pocketbook/2007_en.htm

Table 6: Electricity generation from renewable sources in 2005 compared to the economic potential – by country

Country	Wind Power in GWh 2005	Wind Power Potential in TWh	Wind Power 2005 in % of Potential	Biomass Energy 2005 in GWh	Biomass Energy Potential in TWH	Biomass Energy 2005 in % of Potential	Solar Power (Photo-voltaic) 2005 in GWh	Solar Power (PV+CSP) Potential in TWh	Solar Power 2005 in % of Potential
EU-27	70482			80042			1490		
EU-25	70480			80036			1490		
BE	227	13	1.75%	2114	7.3	28.96%	1		
BG	2	8.9	0.02%		7.7				
CZ	22	5.8	0.38%	739	20	3.70%			
DK	6614	55	12.03%	3982	6.6	60.33%			
DE	27229	226	12.05%	16570	87	19.05%	1282		
EE	54			21					
IE	1112	55	2.02%	130	6.2	2.10%			
EL	1266	49	2.58%	122	7.2	1.69%	1	7.9	0.013%
ES	21219	93	22.82%	3114	40.4	7.71%	78	1297.5	0.006%
FR	963	129	0.75%	5181	79.1	6.55%	15		
IT	2344	79	2.97%	5985	46.1	12.98%	31	24.6	0.126%
CY		6			0.6		1	20.1	0.005%
LV	47			42					
LT				7					
LU	53	0		75	0.4	18.75%	18		
HU	10	1.3	0.77%	1716	11.3	15.19%			
MT		0.2			0.1			2.1	
NL	2067	40	5.17%	6729	9.6	70.09%	34		
AT	1328	3	44.27%	2034	30.6	6.65%	15		
PL	135	65	0.21%	1830	52.1	3.51%			
PT	1773	18	9.85%	1977	15.2	13.01%	3	145.9	0.002%
Ro		7.9		6	40.9	0.01%		9.9	
SI		0.3		114	6.3	1.81%			
SK	7	0.7	1.00%		10.7				
FI	170	27	0.63%	9607	53.7	17.89%	3		
SE	936	63.5	1.47%	8301	80.4	10.32%			
UK	2904	344	0.84%	9646	30.7	31.42%	8		
HR		2.6		14	8.9	0.16%			
MK					2.6				
TR	59	110	0.05%	34	44.7	0.08%		146.6	
IS		1		4	0.1	4.00%			
NO	506	76	0.67%	379	25.8	1.47%			
CH	8	0			8				

APPENDIX 2

Impediments to the use of renewable energy sources and necessary actions for the activation of the potentials.

Technology	Barriers	Needs
Wind Power	– Inflexible grid infrastructure – lack Insufficient testing procedures for large facilities – Insufficient storage systems – Insufficient financial support – Lack of social acceptance – Lack of trained specialised personnel	– Modernisation of the network infrastructure and the EU provisions for network integration – Tests and research and development (R&D) for large-format facilities – Better co-ordination of facilitation programmes within the EU – Special training programmes – Support for innovations in the area of small to mid-sized companies
Solar Photovoltaic	– High energy costs – Techno-economic subjects – Expansion of integration – Lack of specialist personnel – Network access – Regulations and administration	– R&D – Development of a liberalised market – Financial incentives – Measures for export facilitation
Concentrated Solar Power (CSP)	– High energy costs – Insufficient feed-in options in most of the EU countries – Lack of resources for financing of first projects – Investment in the network infrastructure	– Expansion of CSP feed-in tariffs within the EU – Risk equalisation financing mechanisms for large-format demonstration and commercial projects – R&D and demonstration facilities – open EU market for CSP imports – Investment in a trans-European and a trans-Mediterranean super network – Construction plan for a global market
Solar Heating and Cooling	– Heat storage – Lack of financial incentives – System integration – Lack of specialist personnel – Regulations and administration	– R&D in the areas of energy storage and material research – Financial incentives for the implementation of technology
Hydropower Generation (large HPP)	– Lack of institutional support – Complex regulations and administration – Insufficient support for R&D and demonstration facilities – Lack of resources for R&D and demonstration facilities – Social acceptance	– More public support for R&D and demonstration facilities – Focussed and co-ordinated R&D and demonstration programmes on the EI level. – Coherent, harmonised and required EU-wide regulations and administrative guidelines
Hydropower Generation (small HPP)	– Lack of institutional support – Complex regulations and administration – Insufficient support for R&D and demonstration facilities – Lack of resources for R&D and demonstration facilities – Social acceptance	– More public support for R&D and demonstration facilities – Focussed and co-ordinated R&D and demonstration programmes on the EU level – Coherent, harmonised and required EU-wide regulations and administrative guidelines

Technology	Barriers	Needs
Geothermal	– Lack of suitable legislation – Lack of financial incentives – Insufficient clarity in administrative procedure/long-term authorisation – Lack of specialist personnel – Insufficient social acceptance – Fragmentation of existing knowledge	– Coherent financial facilitative mechanisms – Additional incentives – Suitable regulations, standards and authorisation processes – R&D support – International co-operation and alignment of the current standard of knowledge – Training and continuing education programmes
Ocean Wave Power	– Competitive ability of tidal power plants – High training costs for the technology – Insufficient capacity regarding engineers and private investors – Costs of offshore networks and lacking onshore networks – Laws and ordinances regarding the use of coastal areas	– R&D and demonstration facilities – Co-ordinated proposal on the EU level – Long-term feed-in tariffs and support for investments – Coast management on the EU level
Electricity Networks (Smart Grids)	– Unclarified definition/distribution of extension and connection costs between the participants – Regulatory framework – Social resistance – Insufficiently co-ordinated research efforts	– EU Member States must invest a total of at least 400-450 billion EUR into transmission and distribution infrastructures over the next three decades – Depending upon distance between new production sources (such as offshore wind or solar-thermic power plants) and the existing power network, further connection costs may emerge in the amount of 10-25% of the worldwide investments in the power network – Joint design for the integration of new generation technologies – Information and communication technology for control and monitoring – Standard rules and guidelines
Biofuels	– No structural barriers – Biomass availability and sustainability (including the distribution between the energy sectors and the competition from the non-energy sector)	– Reinforced and focussed public support for R&D on the national and EU levels – Financing mechanisms for large demonstration facilities – Harmonisation of the markets, regulations and policy on the EU level

Arrangement pursuant to: EC 2007e, Technology Map:
http://ec.europa.eu/energy/res/setplan/doc/com_2007/2007_technology_map_en.pd

LIST OF ABBREVIATIONS

CHP	Combined Heat and Power
CSP	Concentrated Solar Power
EBRD	European Bank for Reconstruction and Development
ECSC	European Community for Steel and Coal
EEA	European Economic Area
EFRD	European Fund for Regional Development
EP	European Parliament
EREC	European Renewable Energy Council
ERENE	European Community for Renewable Energy
EU ETS	European Emissions Trading Scheme
EURATOM	European Atomic Energy Community
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre
JRI	Joint Research Institute
NAP	National Action Plan
OPTRES	Assessment and optimisation of renewable support schemes in the European electricity market
TEN	Trans-European Networks
TEU	Treaty on the European Union (Treaty of Maastricht)
TFEU	Treaty on the Functioning of the European Union (Treaty of Lisbon)
TWh	Terawatt hour (= 1 billion KWh)

Country Abbreviations

BE	Belgium
BG	Bulgaria
CZ	Czech Republic
DK	Denmark
DE	Germany
EE	Estonia
IE	Ireland
EL	Greece
ES	Spain
FR	France
IT	Italy
CY	Cyprus
LV	Latvia
LT	Lithuania
LU	Luxembourg
HU	Hungary

MT	Malta
NL	Netherlands
AT	Austria
PL	Poland
PT	Portugal
RO	Romania
SI	Slovenia
SK	Slovak Republic
FI	Finland
SE	Sweden
UK	United Kingdom (Great Britain)
HR	Croatia
MK	Macedonia
TR	Turkey
IS	Iceland
NO	Norway
CH	Switzerland

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Climate protection and a secure energy supply both are questions of our future. The European Union must set itself ambitious goals if it wants to maintain its political dynamic. An 80 percent reduction of European carbon dioxide emissions by the middle of this century should therefore be a core project of the EU. Through this the EU would make a major contribution to the protection of the global climate. This would call for nothing less than a new industrial revolution with a huge increase in the efficiency of the use of resources and the coverage of the bulk of energy demands with renewable energy as its central theme. There is a large wind, solar, biomass, geothermal and hydroelectric potential in Europe, although it is unevenly distributed across the EU. In order to exploit this potential, to speed up the development of renewable energy and to encourage co-operation within the EU, new instruments are needed. ERENE (European Community for Renewable Energy) aims to become such an instrument. ERENE could be a great new project for Europe, accentuating the vital importance of common action for Europe's future. This study by Michaele Schreyer and Lutz Mez sets out the circumstances and options for the implementation of such a community. It describes the diversity of the EU's potential for electricity generation from renewable energy sources and identifies the conditions necessary to make better use of these potentials.

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ISBN 978-3-927760-94-3