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PUBLIC FUNDING FOR GREEN ENERGY IN A CONTEXT OF CRISIS

Final report

ISTAS (Instituto Sindical de Trabajo, Ambiente y Salud) on behalf of The European Trade Union Institute

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PUBLIC FUNDING FOR GREEN ENERGY IN A CONTEXT OF CRISIS

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The project has been coordinated by ISTAS (Union Institute of Work, Environment and Health - Instituto Sindical de Trabajo, Ambiente y Salud).

ISTAS is a self-managed trade union's technical foundation supported by the Spanish Trade Union Confederation CCOO to promote the improvement of working conditions, occupational health and safety and environmental protection in Spain.

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I. INTRODUCTION

1. Background

In the context of the crisis and reduction of public expenses, there is a threat for ambitious politics for sustainable development. In Europe governments are reconsidering their support to green-energy initiatives in an age of austerity. In the boom times before the global economic crisis, the investments in clean energy have been continuously increasing, driven by the concern about energy security and climate change.

European Directive 2009/28/CE about the promotion of the renewable energy establishes a mandatory target of 20% share of energy from renewable sources and 10% share of energy from renewable sources in transport in Community energy consumption by 2020. To reach this objective mandatory national targets are also established to provide certainty to investors and to encourage continuous development of renewable technologies.

Also investment flows in clean energy have grown substantially since 2008, overcoming the global economic and financial crisis with the aid of substantial public funding stimulus. However, current economic conditions and increased pressure on sovereign balance sheets leave the clean energy sector facing complex challenges in maintaining investment flows, achieving price parity and reaching scale.

As a result of public budget cuts in many countries the level of support to renewable energy is threaten or already decreasing. Greece, France and the U.K. have cut subsidies for solar power since the recession began in 2008, and even economic powerhouse Germany has announced it will eliminate government support for solar panels by 2015. Spain — once the largest solar-energy market in the world — halted subsidies for new renewable-energy projects altogether at the beginning of 2012.

The first big cuts came in 2010, when Germany and Italy pulled back on solar incentives. Then, at the end of 2010, France followed suit by halting its solar feed-in tariffs completely.

But under an economic crisis situation, targeted public funding, along with policy and regulatory certainty, are particularly important to maintain growth and realise economic potential.

In 2010 there was more than 1.144.000 people employed at the renewable energy sector in Europe, according to Observ'ER, and cuts in public fundings at this state of development of the sector threaten the maintenance of these jobs.

The European mandatory target of 20% share of energy from renewable sources is also threatened by public funding cuts.

Even in the current economic climate, there are strong reasons for investment in particular areas of clean technology:

- Many of the drivers for clean energy investment that existed prior to 2008 still apply today such as requirements to respond to climate change and concerns regarding energy security.
- Energy efficiency (EE) can reduce costs. In Ireland, for instance, it is reported that €2.25 billion could be saved in the economy in 2020 through avoided energy costs.
- Manufacturing and deployment of clean energy technologies in domestic markets creates jobs when many other sectors are undergoing restructuring or lack

competitiveness. The US solar industry experienced a jobs growth rate of 6.8% in 2010/2011 compared to 0.7% for the general economy.

- While some clean energy industries are commercially competitive, others have barely started their journey and risk becoming stalled.

The purpose of this study is to analyse this situation to reach an understanding about the evolution of public funding for green energy in Europe.

This research will cover six case studies of EU countries having different industrial structure, degree of technological development and efforts to the promotion of green energy: Germany, Spain, Italy, U.K, Sweden/Finland/Norway/Denmark and Bulgaria.

The main goal of the project is to understand the evolution of public funding for green energy in a context of crisis in Europe. The research will map national situations and will identify major trends in six different EU member states about direct and indirect funding or support for producing green energy.

2. Objectives

The main objective of the project is to identify the support schemes for renewable energy sources used across Europe and evaluate the impacts of the economic crisis on such schemes and the development of renewable technologies, particularly to meet the 2020 targets.

Thus, the project is intended to provide valuable background information, starting with a general overview about the policy and regulatory framework at the European level and a short review of the different national schemes to support and fund renewable energies in Europe. Special consideration was made to fund innovative renewable technologies in the region.

Then the research is focused in 6 countries: Germany, Italy, United Kingdom, Spain, Bulgaria and Sweden that are carry out by expert partners at each country.

3. Report structure

Preliminary report

Chapter 1 starts with the policy and regulatory framework, highlighting the Climate and energy package and the Energy and Low Carbon Economy Road Maps by 2050.

Chapter 2 describes the current situation of the renewable energy sources in Europe, providing data by technology and by Member State.

The employment is a remarkable issue in this document. Thus, in the chapter 3 there is a description of the present and potential jobs in the renewable energy sector in the medium-long term. And chapter 4 provides the European Trade Union Confederation point of view regarding the renewable energies' role in the fight against climate change and the transition to the green economy.

In chapters 5 and 6, there is an explanation of the different types of instruments to support and fund the renewable energies in Europe –in the electricity, heating and transport sector-, paying special attention to the innovative technologies.

Chapter 7 and 8 consider the main changes on the support schemes during the economic crisis across the Member States and the main expectations to fulfil the global renewable energy goal by 2020.

Country report

The six country reports follow the same table of contents.

- **Chapter 1. Introduction**
- **Chapter 2. Renewable energy deployment**

General description about the energy supply in each country and the situation of the renewable energy production in electricity, heating and transport.

- **Chapter 3. Renewable energy sector**

Short characterization of the renewable energies impacts in terms of economic benefits, employment creation and CO2 emissions savings.

- **Chapter 4. Overview of available renewable energy support instruments before the crisis**

An overview of types of economic instruments and relevant policy and regulatory framework implemented to support and fund the renewable energy development.

- **Chapter 5. The economic crisis effects in financing RE**

General description about the economic crisis in the national economy and the changes implemented on renewables support schemes and funding during the economic crisis. There is also a consideration on how these changes have affected the renewable energy sector in terms of employment and 2020 targets' achievement.

- **Chapter 6. Social debate about RE**

Interviews were carried out in the six countries to obtain the main social partners' opinions (trade union and employer's organizations) and the central authorities in charge of energy issues, following the same outline:

Renewable energy situation
1. What is your opinion about the role of RE in the energy supply, in the energy mix?
2. What is your evaluation about the RE deployment? (Before and after the crisis, future scenarios)
3. What is your opinion about renewable energy targets? Are they ambitious enough? Do you think they will be achieved?

Support schemes and funding
4. What support schemes (used in your country) you find most useful and what others could have been implemented? Are these instruments the main driver or the main barrier for the RE promotion?
5. Has the support schemes and public funding evolved due to the current economic crisis?
6. What is your impression about renewable energies in the future? How is going to be the support schemes? What are your recommendations about support mechanism to renewable energies in the future?

Employment
7. How do you think the RE employment is going to evolve? Are the green jobs a possible way out of the crisis?
(Specific questions for social partners):
8. What is the renewable energy workers level of affiliation?
9. How is the quality of their jobs (in terms of salary, qualification…)?
10. Are there collective bargains at renewable energy sector?

- **Chapter 7. Conclusions**
- **Annexes and references**

4. Methodology

The desk research for the preliminary report and the countries studies is based on secondary sources of information.

The six country reports have a common methodology that included in-depth interviews with stakeholders besides the desk research.

At least three interviews are considered: competent authority in energy issues at the central level, trade union's organization and employer's organization.

These two methodologies have allowed to know in depth both the renewable energy situation and social debate about the issue at each country.

5. Partnership

Researchers	
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II. EUROPEAN PRELIMINARY REPORT

1. European policy framework

The European Union climate and energy package came to light in 2008. The package aims at reducing energy consumption and increasing the use of renewable energies in the EU.

The European Union promotes the change of energy model through its Directive 2009/28/CE on the promotion of the use of energy from renewable sources which sets three compulsory goals for all Member States for 2020: a 20% reduction of greenhouse gas emissions, a 20% reduction of primary energy consumption through energy efficiency and a total share of 20% of renewable energy in final gross energy consumption, as well as a 10% share of renewable energies in transport.

This Directive is the last step of a process of encouraging the use of renewable energy that began in 1997 with a White Paper that set a target of 12% of renewable energy share in gross inland consumption by 2010. Since then, renewable energies have increased their contribution by 55% in absolute terms of energy, although this does not imply an important increase in the coverage of demand, given the fact that demand has also grown significantly.

The Directive requires each Member State to adopt a National Renewable Energy Action Plan (NREAP). These plans must include Member States' national targets for the share of energy from renewable sources consumed in transport, electricity, heating and cooling in 2020. They have been of significant value to evaluate the fulfilment of EU 2020 targets and to establish specific goals for each Member State and technology.

The Directive also requires Member States to undertake administrative reforms and simplification of planning, authorisation and electricity grid operation as well as developing the electricity grid to manage increasing flows of electricity from renewable energy sources. It establishes strict sustainability criteria for the use of biofuels and bioliquids and cooperation mechanisms to enable Member States to meet their goals more cost-effectively. The Directive already includes a 2014 review clause regarding the GHG savings thresholds, the measures and impacts of biofuels and bioliquids, cooperation mechanisms and a requirement to present in 2018 a post-2020 roadmap.

Along with an increased use of energy from renewable sources, measures taken to reduce energy consumption in the EU would allow to achieve the expected goals. Buildings account for 40% of total energy consumption in the EU. Therefore in 2010 it was adopted the European Directive 2010/31/EU on the energy performance of buildings, updating the Directive 2002/91/EC. These two Directives introduced the obligation of using renewable energy sources and the application of minimum requirements to energy performance in buildings.

In March 2011, the Commission published a roadmap for a low-carbon economy and a transport white paper. Furthermore the Commission will shortly publish a roadmap on the EU's energy system until 2050. Both documents examine the consequences of achieving substantial reductions (80-95%) of greenhouse gas emissions in the EU by 2050 (as part of a global agreement with similar commitments of other countries), and the implications for energy policy beyond the 2020 horizon.

2. Renewable energy development

Introduction

During the past decade, the EU emerged as the world's leading region in developing and implementing renewable energy technologies; about one-third of the estimated global investment of 150 billion USD in energy efficiency and renewable energy was made in the EU in 2007.

The renewable energy goal is a headline target of the Europe 2020 strategy for smart, sustainable and inclusive growth. According to the European Commission Communication *"Renewable Energy: a major player in the European energy market"* in early 2012, European policies were beginning to work and the EU is currently on track to achieve its goals.

However, the economic crisis has made investors cautious about the energy sector. In Europe's liberalised energy markets, the growth of renewable energy depends on private sector investment, which in turn relies on the stability of renewable energy policy.

Substantial growth in renewable energy markets suggest that significant "maturing" of technologies is occurring. In the period 2005-2010 average photovoltaic system costs have declined by 48% and module costs by 41%. Industry expects costs to drop even more based on the growth driven by current government support policies, reforms and removal of market barriers. Onshore wind investment costs fell by 10% between 2008 and 2012. Photovoltaic systems and onshore wind production are expected to be competitive in several markets by 2020.

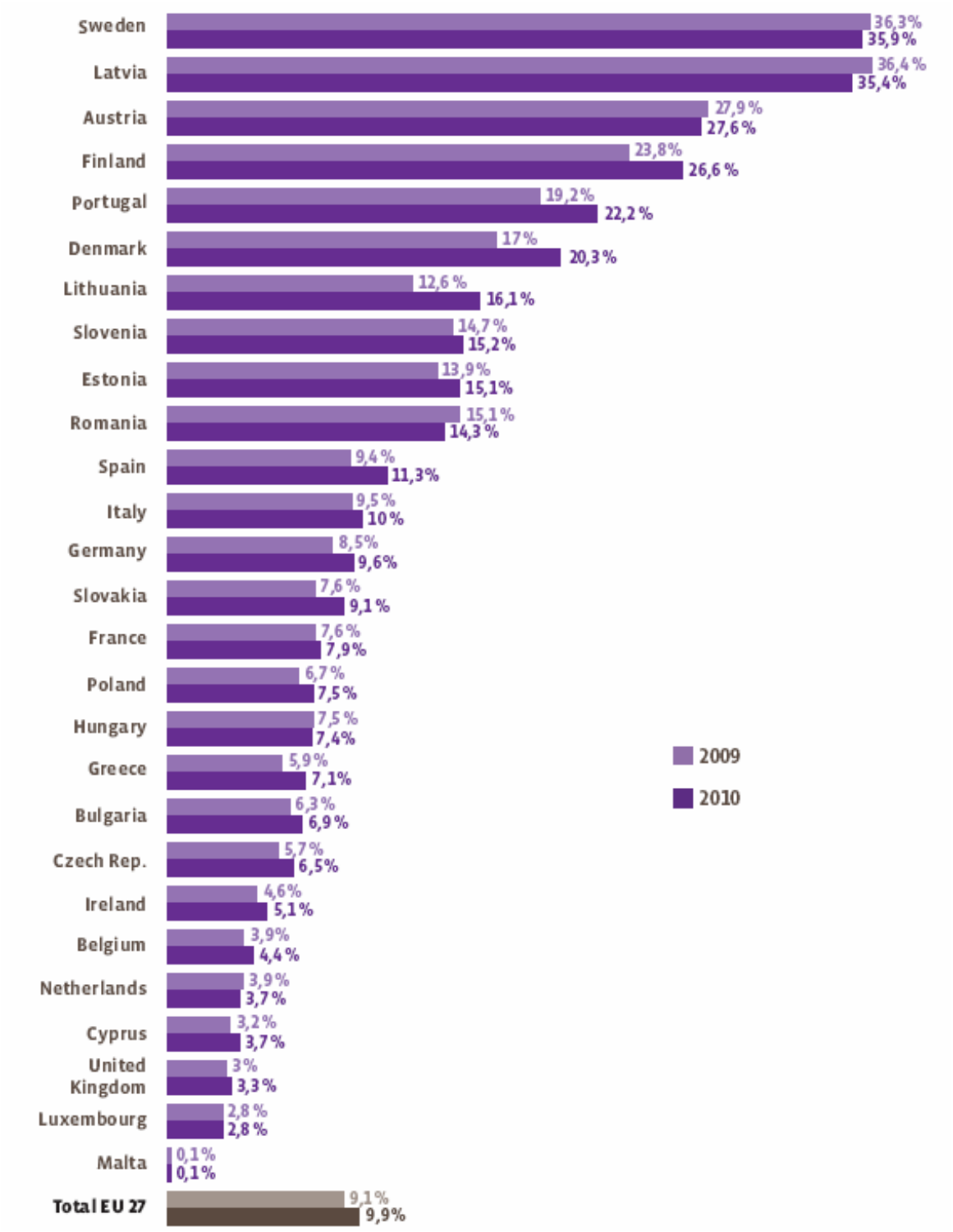
Key data for the EU-27 Member States

According to Eurostat figures, the primary production of renewable energy in the EU-27 in 2009 was 148.4 million tonnes of oil equivalent (toe) – an 18.3 % share of total primary energy production. The volume of renewable energy produced in the EU-27 had an overall increase of 60.2 % between 1999 and 2009, equivalent to an average increase of 4.8 % per annum.

Renewable energy share of gross final energy consumption in the EU-27 was 12.4% in 2010 (11.5% in 2009). The countries with highest share of renewables are Sweden, Latvia, Finland, Austria and Portugal –see figure below-. Renewable energy share in total electricity consumption was 19.8% in 2010 (18.2% in 2009) and the RE share of gross inland energy consumption was 9.9% in 2010 (9.1% in 2009)[1].

[1] These figures were published by Eurostat, the statistical office of the European Union in connection with the EU Sustainable Energy Week in 2012, which promotes energy efficiency and renewable energy.

Renewable energy share of gross final energy consumption in EU-27 by countries

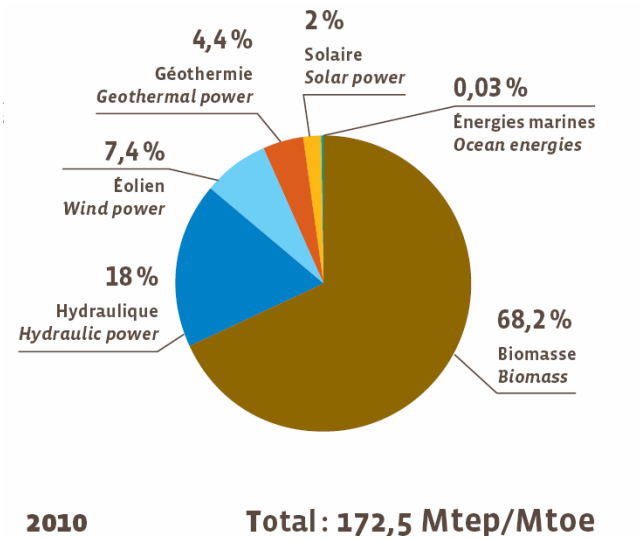


Source: Eurostat, 2011

Data by technology

Traditionally biomass and hydraulic power have been the renewable technologies most used in Europe; however since last decade wind power is increasing its weight at European renewable energy mix. In 2010, biomass (68,2%) was the most important renewable energy source in Europe, followed by hydraulic power (18%), wind power (7.4%), geothermal energy (4.4%) and solar power (2%).

Renewable Energy Mix by technology. Europe, 2010



Source: Eurobserver, 2011

Total installed **wind power** capacity in the European Union is estimated at 84,762 MW in 2010.

The European market grew in 2010 with the implementation of new offshore projects and the development of some Eastern European markets. However the balance for 2010 year is poor in comparison with previous years. Germany and Spain, the leader countries in this technology, decreased their newly installed capacity: Germany additional capacity has decreased by 19% and Spain by 40% in 2010 (compared with 2009) due to the economic crisis and legal uncertainty.

The contraction of historic wind power markets in Europe (Spain, Germany and Denmark) is rattling European manufacturers. Not all the production segments are affected by this situation: in 2010 the European offshore market entered in a new development phase.

The United Kingdom Department of Energy and Climate Change stated that British power capacity rose to 5,387 MW in 2010 including 1,341 MW offshore capacity, up from 4,424 MW in 2009 (including 941.2 MW). In the next few years, the UK should consolidate its world top ranking in the offshore segment.

Total installed capacity with offshore technology in Europe has achieved 2,913 MW, in 2010 (according to European Wind Energy Association). The National Renewable Energy Action Plans (NREAP) has established roadmaps that set a 213.6 GW goal for installed capacity by the 2020 timeline across the European Union.

Offshore wind energy was identified by the European Union as a key power generation technology for the renewable energy future, and a field in which Europe should become a technological leader on a global scale. Continued R&D support for European

manufacturers from policy makers is necessary to maintain Europe's technological lead in offshore wind energy.

There is also an urgent need to invest in adequate infrastructure (ports and harbours, grids…) and training in order to ensure workforce is ready to fill the thousands of new jobs being created every year by the offshore wind sector.

In 2010 for the first time, Europe's **photovoltaic** sector installed more new capacity than any other renewable electricity source. The annual global installation in 2010 more than doubled that of 2009, reaching almost 30,000 MW installed photovoltaic (PV) capacity.

The **small hydropower** sector complies with strict regulations, as water courses are fragile resources and are exploited form many purposes (drinking water, farming or industrial activity, transport, etc...), so its grown is very limited. Installed capacity in Europe reached 45,775 MW in 2010, being Italy the leader country with almost the 25% of installed capacity.

Spain concentrates all of Europe's commercial **concentrated solar technology** in Europe. However the installed capacity is expected to grow significantly over the next years as a result of new projects in Spain, Italy and France, followed by Portugal, Greece and Cyprus.

Solid biomass heating has experienced an important consumption increase due to additional production infrastructures and improved organisation of the wood-energy supply chain. France, Germany, Sweden and Finland are the most important producers of this kind of energy. Also solid biomass is used to produce electricity, mostly in cogeneration facilities..

According to EurObservER's data, **solar thermal** market for hot water production and heating shrank beyond the estimates in 2010 due largely to the slowdown of the construction industry and to competition with the building-integrated photovoltaic systems market which is more lucrative. Almost every country in Europe has reduced the new capacity installation: the German, Austrian and Spanish markets plummeted in 2010, and the French, Portuguese and Belgian markets have also declined. These countries represent the most important markets in Europe although the Italian, also very important, has grown during 2010. This growth can be attributed to the Italian government's announcement that it would curtail 55% of taxes for residential solar thermal systems from 2011 on.

Biofuels continued to replace petrol and diesel consumption in the European Union during the last years. Biodiesel (77.3%) dominates the European biofuel consumption for transport, ahead of bioethanol (21.1%), vegetable oil (1.3%) and biogas (0.4%). The biofuel share in the energy content of all fuels used in transport has reached a 4.7%, with total consumption in the EU of 14 Mtoe in 2010.

Turnover

The economic activity of the 27 European Union Member States for 2010 stemming from renewable energies is valued in more than 127 billion euros – a 15% improvement on the 2009 figure of 120 billion euros. The photovoltaic sector shows an excellent performance with sales of 45,564 million euros in Europe's markets, which ranks it as top earner outperforming wind power. Photovoltaic is followed by the wind power and solid biomass sectors.

Germany leads Europe in both sales and jobs. Italy, France and Sweden follow Germany in turnover.

Turnover EU-27, 2010, by country

	Turnover (M€)
Germany	36860
Italy	16164
France	12602
Sweden	10158
Denmark	7981
Spain	7861
UK	7419
Austria	5655
Czech Republic	4612
Belgium	3925
Netherlands	2396
Poland	1870
Romania	1661
Portugal	1606
Finland	1291
Greece	1150
Others	3992
Total	**127203**

Source: Eurobserver 2011

Turnover EU-27, 2010, by technology

	Turnover (M€)
Photovoltaic	45564
Wind power	29264
Solid Biomass	24621
Biofuels	13281
Biogas	4084
Solar thermal	3864
Small hydropower	2673
Geothermal	3847

Source: Eurobserver 2011

3. Employment in the RE sector

The recent report *"The State of Renewable Energies in Europe"*, published by EurObserv'ER in the beginning of 2012, found that the renewable energy sectors have more than 1,114,000 employees in the 27 European Union Member States. This is a 25% increase on the 2009 figure (912,220).

The major employer is solid biomass with more than 273,000 jobs (direct and indirect full time jobs), followed by photovoltaic and wind power with respectively 268,110 and 253,145 jobs estimated for 2010. Business in the photovoltaic sector surged in 2010, which led to a 50% increase in job numbers and in countries as Germany, France and Italy jobs expanded by 70% or even more.

Germany (36, 360 workers) still holds an undisputable lead over its nearest rivals in the jobs league with more than twice as many jobs as in France (174,735 workers) and over three times as many as in Italy (108,150 workers). Spain ranks fourth (98,300), followed by Sweden (54,780 workers) -see annex-.

This biomass sub-sector has a crucial role in Member States. The use of **solid biomass** has increased 8% in the European Union in 2010. The forestry sectors are major employers, where the energy input is created and delivered to end-users. Biomass-conversion technology's dual uses as both electricity and heat source are a major asset, together with the multitude of forms taken by biomass – wood chips, timber, pellets, sawdust, logwood, pulp, etc. The economic value for construction, manufacturing and installation and the biomass supply side was € 24.6 billion, and the jobs were stable in 2010 (273,150). The major biomass user and industry countries are the Nordic countries of Sweden and Finland, followed by Germany and France, then Poland and Romania in Eastern Europe. In the Mediterranean, Spain and Italy are showing increasing enthusiasm for solid biomass fuels with significant socioeconomic impacts for their economies.

As it was mentioned above, in 2010 Europe's **photovoltaic sector** installed more new capacity than any other renewable electricity source over the year (over 13 GWp of new capacity). Cells and modules production thrives throughout Europe, although major production centres are now, primarily in China, Taiwan and the USA. Nevertheless, the economic effects created in EU countries stem from the massive installation activity, the production of equipment, operation and maintenance activities. The employment level increased by 70% to 268,110 individuals employed, compared to 2009.

The wind energy sector employed 253,000 workers in the EU. Despite a sluggish market for newly-installed capacity, employment is more or less stable. First explanation is that a number of Eastern European markets, as Poland and Rumania, have built up capacities significantly. These developments have partly offset the sluggish performance of their long-established neighbouring markets (Spain, Germany, France, and Italy that still represent the core of employment and economic value in Europe). Secondly, the socioeconomic consolidation is driven by the European offshore market, most notably in the United Kingdom. Finally, it can be seen that the European wind industry players' expertise is appreciated in other world markets. Leading manufacturers display higher export shares and have gone to emerging markets in China and the US, which have helped the sector to maintain its level of economic activity.

The 2008 financial crisis and the current economic recession have affected negatively the **solar thermal sector.** This sector has contracted in the major markets (Spain, Austria, Germany, and France). The slowdown in the building construction segment is

another negative factor for the market in Spain where the installation of solar thermal systems is legally binding. Competition with PV systems that are often seen as a more financially attractive option is another limiting factor. The weight of the sector is around 49,000 jobs (down 9% from 54,000 in 2009). In its annual statistical report, the European Solar Thermal Industry Federation (ESTIF) quantified the European industry's annual workforce in 33,500 employees, largely in SMEs, which are selling, planning, installing and servicing solar thermal systems.

Hydropower is the most mature renewable energy technology. Its employment is generated and maintained by manufacturing electromechanical equipment for hydro installations, by civil engineering (the construction of dams, the refurbishment and up-grading of existing hydro plants) or by operation and maintenance, the latter being a major source of socioeconomic impacts.

The hydro power industry in developed markets such as the EU is focused on re-licensing and repowering plants as well as adding hydro generation to existing dams. Installed net capacity up to 10 MW has grown slowly but steadily over the last few years to reach 13,066 MW to date. The trend for gross electricity production has also been slightly positive.

The small hydro sector was stable in 2010, accounting for a workforce of 16,000 across the EU-27 countries. The main countries using hydropower in terms of jobs are Austria, Italy, France, Spain, and Germany.

Geothermal energy can be used as heat or electricity. Whereas geothermal electric power plants are found in only a few countries, 22 of the 27 European Union are now using geothermal heat. Employment is also generated in equipment manufacturing and operations and maintenance (O&M) activities in the EU. The geothermal workforce in exploration, drilling, installation and O&M consists of more than 12,500 employees.

2010 saw a remarkably high 31% growth of primary energy production from **biogas** (agricultural plants, landfill and sewage gas, and other deposits). The major European biogas markets are Germany, the United Kingdom and Italy, Poland and France. The sector's counts roughly 53,000 jobs in the EU-27. Jobs are created by investment in new facilities, but also require a substantial amount of operation and maintenance, and a significant labour force on the agricultural side. Across Europe, farmers have started to generate additional benefit by growing energy crops or substrates as biogas plant input.

The growth in **bioethanol** fuel consumption (26.1% between 2009 and 2010) outpaced that of **biodiesel** consumption (11.1%), yet biodiesel still accounts for three-quarters of European biofuel consumption. On the assumption of 0.007 jobs per toe for biodiesel and vegetable oil production, and 16 jobs per million litres of ethanol produced, employment number 150,000 jobs in 2010 in the EU of 27 (including the downstream activities of biofuel production plants and the distribution sector and the upstream activities – the agricultural supply chain for biofuel).

Finally, EurObserv'ER estimates that nearly 40,000 workers are directly and indirectly employed in the European **Ground Source Heat Pump** sector and around 25,390 jobs, in the **renewable municipal solid waste**[2] -in 20 countries that are either covered by Confederation of European Waste- Energy Plants (CEWEP)-.

[2] According to the Renewable Energy Directive, the ground source heat pumps and the 50% of the *municipal solid waste* are considered renewable energy sources to meet the renewable energy targets by 2020.

Jobs potential in the renewable energy by 2020-2030-2050

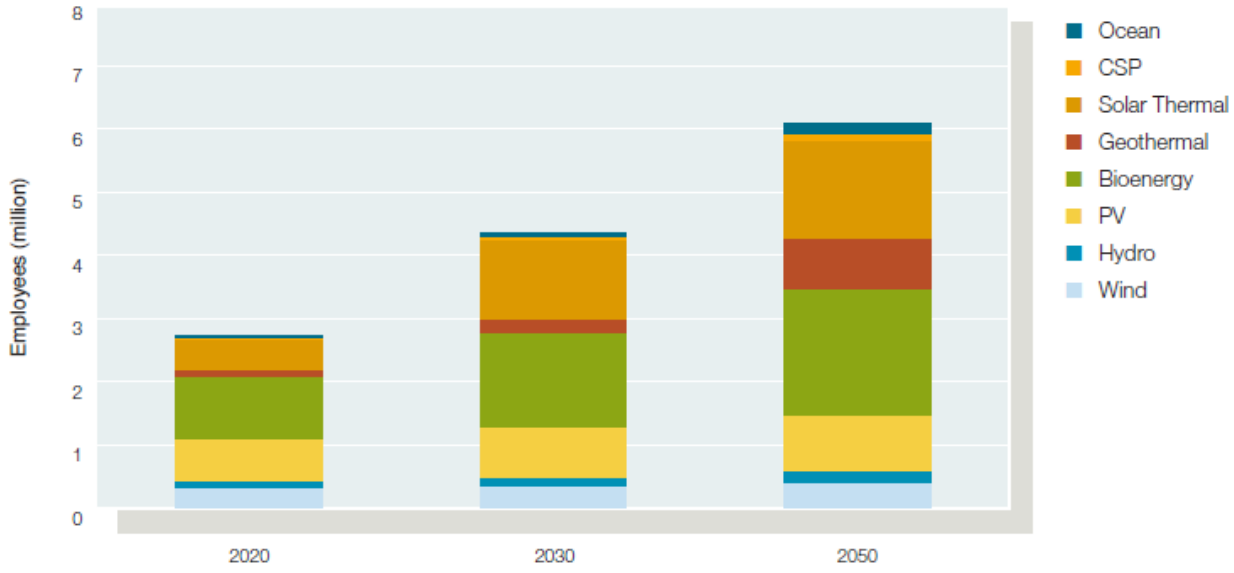
Facing the most serious economic crisis since its creation, the EU member states have to find a solution for their high unemployment rates. Beyond that time horizon, further efforts are needed to secure the development of the European economy delivering high levels of employment, prosperity, sustainability and international competitiveness.

The development of renewable energy also causes an important structural-policy side effect, with jobs being created in those regions where they are particularly needed. Coastal regions or rural areas benefit from the construction and utilisation of renewable energy technologies. Former coal regions, for instance, see a revitalisation of their industrial areas and new local economic cycles and resulting employment.

According to a Commission's study[3] in 2009, reaching the 2020 renewable energy targets is expected to lead to around 2.8 million jobs (gross employment) in the renewable energy sector and generate a total value added of around 1.1% of GDP and 3.4 million employees by 2030.

In the *"A 100% Renewable Energy Vision for the European Union"* report, the European Renewable Energy Council[4] proposed a pathway to achieve 100% renewable in the energy sector. Estimates are based on 550,000 employees the European renewable energy industry by the end of 2009. Considering that a target of 45% renewable energy in final energy consumption in 2030 is met, this would provide gross employment of about 4.4 million in the renewable energy sector – an annual average growth rate of about 6% on 2020 (2.7 million employees). (EREC, 2010). If a target of 100% renewable energy by 2050 was followed, employment in the renewable energy sector would bring 6.1 million people into work. This constitutes an average annual increase of gross employment of 36% and 30% respectively compared to 2009.

Gross employment in the Renewable Energy Sector (2020-2030-2050)



Source: EREC, 2011.

[3] Ragwitz, M. et al (2009).

[4] EREC, the European Renewable Energy Council, is the umbrella organisation of the major European renewable energy industry, trade and research associations active in the field of photovoltaic, small hydropower, solar thermal, bioenergy, ocean & marine, geothermal, wind energy, and solar thermal electricity. http://www.erec.org/

4. What is the point of view of the European unions about green energy?

Ambitious climate change policies

Unions know that the climate change challenges the energy sector directly. The transformation from fossil-based energy production to an energy sector mainly based on renewable energies and energy efficiency is the crucial issue for achieving the carbon reduction aims.

The European Trade Union Confederation (ETUC) supports that through increased binding energy efficiency standards and investment in renewables, the European Union should ensure that its domestic target reflects the IPCC's recommendation for developed countries: -25 to -40% domestic CO2 emissions by 2020. This target should be seen in the context of a longer-term policy to achieve -80 to -95% by 2050 on 1990 levels, and might be pursued in Europe provided that the conditions for just transition are met.

Renewable energies for an independent, secure and distributed energy supply

Europe must aim at ensuring its energy independence and diversify its energy supply, through strategic planning and by means of an ambitious adjustment in favour of renewable energy to the detriment of fossil fuels.

This is the reason that the ETUC, as a member of Spring Alliance[5], called for an obligatory share of at least 35% of renewable in electricity supply EU-wide by 2020 and for a promotion of decentralized production and consumption of electricity, heating and cooling. Renewable energies are the most suitable technologies for distributed generation and replace partly energy production from central plants.

The ETUC emphasizes that enormous and immediate public and private investments are required to achieve this renewable energy target involving investments not only in supply of electricity produced with renewable but also huge investments in smart grids, in energy storage, and in production capacities that can be started quickly (mainly with natural gas, including through combined heat and power) when production with renewable sources is insufficient.

A European energy pact with public investments

Europe needs an energy solidarity pact that would respond to the inclusion of 'solidarity' and energy policy in the EU 2020 strategy and to ensure a basis for common and ambitious European energy policies. It would not simply be related to financial transfers between countries, but to collective development of the renewable potential across European regions, a sustainable energy mix and building infrastructure links and trust between countries on energy supply questions. It would contribute to greater European cooperation which would go beyond merely coordinated but fragmented national markets, with a strong role for public authorities.

The new energy pact will need an ambitious and concrete policy of investments, in particular in renewable energies. The most efficient and cost-effective way to meet the renewable and energy efficiency targets for the short and the long term, is government

[5] http://www.etuc.org/IMG/pdf_manfinal.pdf

intervention in the development of publicly regulated and publicly owned renewable and energy efficiency sectors. According to the ETUC, market-based solutions for energy efficiency in particular white certificates trading and independent energy efficiency auditors, are ill-suited to the pace and magnitude of energy efficiency improvements required to address climate change.

Massive public investment is needed in renewable generation: smart electric grids and infrastructure would allow for the development of sustainable electricity usages such as charging infrastructure for electric cars. Public procurement through public electric utilities has also a huge role to play. Public energy research and development should be doubled and redirected towards energy conservation, environmental friendly renewable and electricity grid improvements

Finally, according to ETUC, a European regulation authority should ensure an adequate renewable energy target for each member state, taking into account indicators, such as the level of economic development and the potential for an increase of renewable energy production.

Development of new jobs and transformation of existing jobs

The transformation of the energy generation is a crucial challenge for workers in the energy sector where green jobs can be created. However, unions are convinced that the new 'green' economic sectors in the field of renewable energies could not exist without the participation or the products of the conventional industrial sectors and also depolluting procedures, dismantling and recycling industries. For instance, solar technology could not be conceived without the chemical industry, just as wind power would be not possible without steel.

Therefore, a just transition to a low carbon economy must maximize the creation of decent jobs in the new sectors and mitigate the negative effects for employment in the traditional activities.

Income and training policies should enable employees of fossil energy production facilities, to find work in the growing renewable energy sector, in particular in the field of maintenance.

The ETUC emphasizes its claim, articulated through the Spring Alliance, *"to develop transition programs to anticipated changes in employment patterns, together with stakeholders"*. Likewise, a European framework should be developed to guarantee an adjustment of education curricula and programs to future environmental and social changes. This framework should provide training for the complete chain of providers, installers as well as suppliers of new industries and services in the fields of renewable energy and energy efficiency, building refurbishment and public transport.

On the other hand, the new jobs in the renewable energy sector could be less well-paid and could come with new health and safety risks (e.g. toxic materials from solar power panels) than in the established sectors. From this perspective, the ETUC stresses the importance of closely monitoring the quality of the created jobs.

5. Support schemes and public funding for Renewable Energy

5.1. Support Schemes

Depending on the final energy sector, different types of support measures have been applied in recent years. Most experience with supporting RES is available in the electricity sector, where the EU Directive 2001/77/EC required Member States to increase the share of renewable energy sources in electricity using national support instruments. In contrast, no legislative framework at EU level was available in the heating and cooling sector before the Directive 2009/28/EC was implemented. Support for renewable heating and cooling is mainly based on investment grants and partly tax exemptions.

Although Directive 2009/28/EC obliges countries to use obligations for renewable heating, only some countries, including Germany, Portugal and Spain, have introduced obligations for a minimum share of renewables in the building sector so far. In the transport sector most MS use a combination of an obligation with tax exemptions.

In Europe, main support schemes are feed-in tariffs, feed-in premium and quota obligation.

5.1.1. Support policy for electricity

Feed-in-tariffs (FIT): They are understood as a state regulated minimum tariff for all renewable energy sources; and a variable feed-in tariff based on a variable, time-dependent tariff, set up by statutory law. Tariffs are differentiated by technology and project size and guaranteed for different time periods, and adjusted to inflation and other components such as operation efficiency of the system, cost of technology used, market development of the technology, etc.

With this scheme renewable energy electricity has priority to grid access and use.

FIT have been historically and currently still are the main instruments of support in the EU. They are used in the following Member States: France, Germany, Spain, United Kingdom, Greece, Ireland, Luxembourg, Austria, Hungary, Portugal, Bulgaria, Cyprus, Malta, Lithuania, Latvia and Slovakia. Most countries use a differentiation according to technology, which facilitates the development of a range of technologies due to the different level of tariffs they receive. However, a few countries, including Cyprus and Estonia do not differentiate according to technologies and apply a common feed-in tariff for all technologies.

The advantage of tariffs, compared to feed-in premiums and quota obligations (see below), lies in the long-term certainty of receiving a fixed level support, which lowers investment risks considerably.

The costs of capital for RES investments observed in countries with established tariff systems have proven to be significantly lower than in countries with other instruments that involve higher risks of future returns on investments. Also, the weighted average costs of capital are notably higher in countries with quota obligations, compared to tariff-based systems. By guaranteeing the price and providing a secure demand, feed-in tariffs reduce both the price and market risks, and create certainty for the investor regarding the rate of return of a project. The lower cost for the investor result lower average support cost for society.

The cost-efficiency of tariffs for society decreases when policy makers overestimate the cost of producing renewable electricity. This is because the level of tariffs is based on future expectations of the generation cost of renewable electricity. When these turn out lower than expected, producers receive a windfall profit. It is therefore important that tariffs are reviewed regularly in order to adjust the system to the latest available generation cost projections and to stimulate technology learning. Furthermore, payments should be guaranteed for a limited time period (approx. 15-20 years) that allows recovery of the investment, but avoids windfall profits over the lifetime of the plant.

Feed-in-premium (FIP)**:** paid on top of the electricity price, these are minimum and maximum prices for the overall remuneration level determined on an hourly basis. Tariffs are guaranteed for different time periods.

Power is sold on conventional markets.

Often a feed-in premium or a quota obligation for large-scale and/or mature technologies is combined with a feed-in tariff for small-scale and/or less mature technologies.

Feed-in premium systems have gained ground over the last years and are used as main support instruments in Denmark and the Netherlands. In Spain, Czech Republic,

Estonia and Slovenia premiums exist in parallel to the tariff system. These Member States have introduced the possibility to choose between feed-in tariffs and premiums for a selection of technologies. The flexibility and coverage of the systems differs from country to country.

Premium systems provide a secure additional return for producers, while exposing them to the electricity price risk. Compared to feed-in tariffs, premiums provide less certainty for investors and hence, imply higher risk premiums and total costs of capital. There are different design options for premium systems. Premiums that are linked to electricity price developments, e.g. limited by cap and floor prices, provide higher certainty and less risk of over-compensation than fixed premiums.

The level of premiums is based on future expectations regarding the generation costs of renewable electricity and the average electricity market revenues. Therefore premium systems also embody the risk of inducing additional costs for society and windfall profits for producers when production costs are over-estimated, or electricity prices and learning rates are underestimated by policy makers. Time limits and a regular review of cost projections and adjustment of premiums based on these projections is therefore also important in feed-in premium systems. Both Denmark and the Netherlands have applied such practices. Denmark has put a cap on the overall return for producers, thereby limiting societal costs. In the Netherlands the level of the premium is determined annually and an overall cap is set on the total cost of the support.

Quota obligation: Governments impose minimum shares of renewable electricity on suppliers (or consumers and producers) that increase over time. If obligations are not met, financial penalties are to be paid. Penalties are recycled back to suppliers in proportion to how much renewable electricity they have supplied.

Obligations are combined with renewable obligation certificates (ROCs) that can be traded. Hence, ROCs provide support in addition to the electricity price and used as proof of compliance. A ROC represents the value of renewable electricity and facilitates trade in the green property of electricity. Quota obligations with certificates expose producers to market signals, which can be beneficial from a power system operation perspective.

Another related advantage of quota obligations compared to feed-in tariff and premium systems, is the fact that support is automatically phased out once the technology manages to compete. Tradable certificates represent the value of the renewable electricity at a certain time. When the costs of renewable technologies come down through learning, this is represented by the adjustment of the price of certificates. On the other hand, this might be a challenge for plants already in operation that did not profit from this technological learning. Furthermore, certificate prices are volatile to other market influences (e.g. exercise of market power).

Uncertainty about the current and future price of certificates increases financial risks faced by developers. This uncertainty can have a negative impact on the willingness to invest. Because producers do not only sell their electricity on the market, but also their certificates, the risk on the certificate market is added to the risk on the electricity market. This uncertainty increases the level of risk premiums and cost of capital. As these costs are usually transferred to consumers, the societal costs of renewable electricity support are usually higher than under feed-in tariff and premium systems.

Depending on the design, quota obligations tend to stimulate the development and deployment of lower-cost technologies and generally discard innovations in more costly options. This is particularly the case for quota obligation systems that are technology-neutral and do not make a distinction between renewable energy options.

For more mature technologies such biomass combustion and possibly onshore wind, such a system may be appropriate, but can lead to windfall profit if the marginal price is set by more expensive technologies.

Renewable quota obligations have been introduced in Belgium, Italy, Sweden, UK, Poland and Romania.

Tendering schemes: They are used for specific projects (large-scale) or technologies (commonly for offshore wind).

Tendering schemes for offshore wind are employed in the Netherlands, UK, Denmark and Spain. Its advantages include the amount of attention it draws towards renewable energy investment opportunities and the competitive element incorporated in its design. Its handicap is that the overall number of projects actually implemented so far has proven to be very low.

Loan guarantees: Is a financial tool in which government guaranteed debt. Loan guarantees can provide access to low-cost capital for projects that might be considered high risk by the commercial banking and investment community. It is very used in USA.

Soft loans – or low-interest loans- that are loans with a rate below the market rate of interest. Soft loans may also provide other concessions to borrowers, including longer repayment periods or interest holidays. On a national level, soft-loans are available in Germany, Netherlands, Bulgaria, Estonia, Malta and Poland.

Investment grants: are available in several Member States and are often devised to stimulate the take-up of less mature technologies such as photovoltaic. In Finland, investment grants and subsidies are the only support available on a national level.

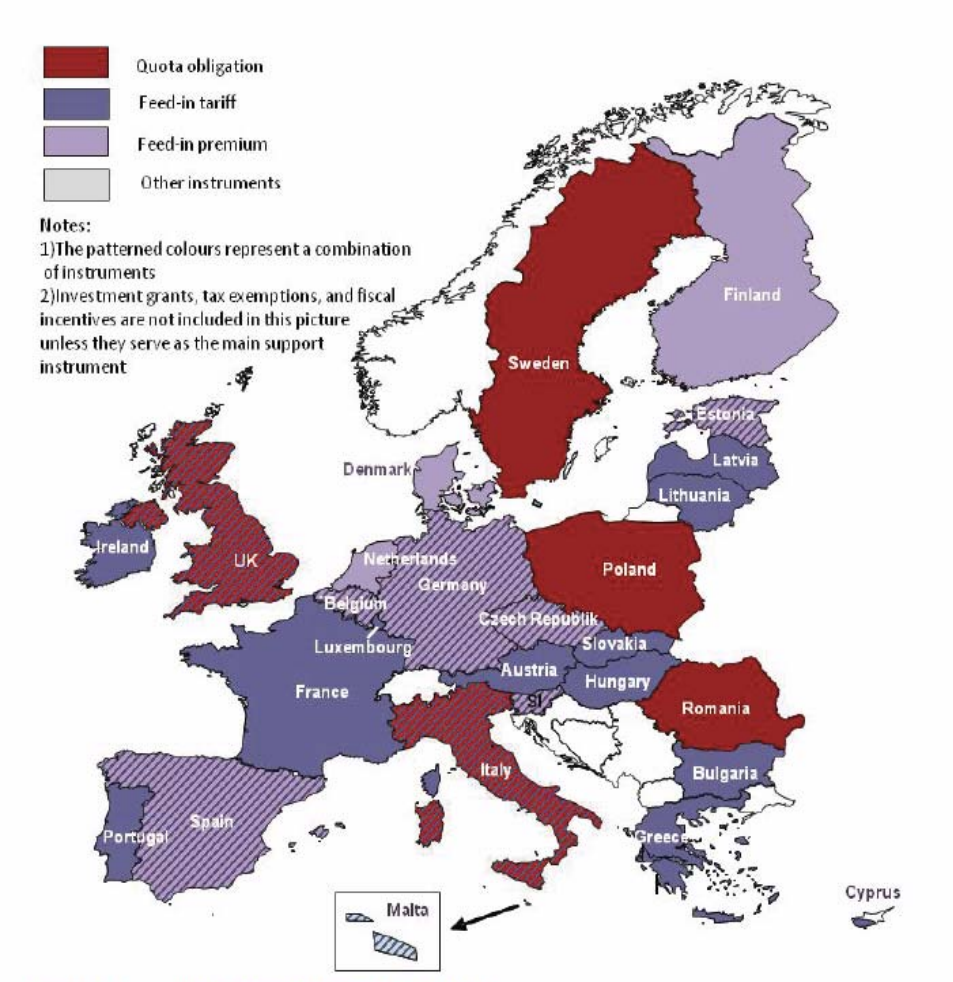
Tax exemptions: Tax incentives or exemptions are often complementary to other types of renewable energy incentive programmes. They are powerful and highly flexible policy tools that can be targeted to encourage specific renewable energy technologies and to impact selected renewable energy market participants, especially when used in combination with other policy instruments. A wide range of tax incentives are present in the EU.

Some countries, including Spain, the Netherlands, Finland and Greece provide tax incentives related to investments (including income tax deductions or credits for some fraction of the capital investment made in renewable energy projects, or accelerated

depreciation). Other Member States, including Latvia, Poland, Slovakia, Sweden and the UK, have devised production tax incentives that provide income tax deduction or credits at a set rate per unit of produced renewable electricity, thereby reducing operational costs. Investment and production tax exemptions are most prominently present in the EU.

In EU-27, all Member States use FIT, FIP or Quota support schemes.

RES electricity support instruments in the European Union



Source: Ragwitz, M. et al (2011).

Compared to previous analyses the policy effectiveness in quota-using countries in the last two years shows improving values for low-cost technologies (onshore wind and biomass), but in general feed-in systems still appear to be more effective than quota obligations.

5.1.2. Support policies for renewable energy source (RES) heat and cooling

European, as well as, Member States' policies has provided relatively few incentives for the application of RES heat and cooling (RES-H&C) in the past. In recent years, these options are receiving more attention from policy makers.

The main support comes in the form of investment grants and tax exemptions. These are available in quite some Member States for most RES-H&C technologies. Financial incentives such as soft loans are less commonly available. RES based district heating receives relatively little attention from Member States. Austria, Finland, Hungary and Lithuania are exceptions.

The European Commission at its communication about renewable energy progressing towards the 2020 targets (2011) stated that "given the cost reductions that have occurred in micro units in recent years, Member States could start to consider regulatory rather than financial solutions at the household level". Use obligation is a regulatory instrument, but it has been applied only in Spain and Germany.

5.1.3. Support policies for biofuels

The support for biofuel consumption in the Member States is often a combination of obligations with tax exemptions. In few instances, only one of these two instruments is used. The levels of support for biofuel obligations are very difficult to assess since the prices implied by these obligations are typically not public.

Due to increased concerns over the sustainability of biofuels, the EU is currently working on new rules designed to ensure that only biofuels made from energy crops and waste from sustainable plantations are allowed to count towards the targets.

5.2. Support schemes effectiveness

Ecofys, a consultancy in renewable energy and energy and climate policy, has done an evaluation of these support systems for European Commission. Conclusions they achieved are summarized below:

Heat sector

- There are some low profit levels in heat sector that need to be increased.
- Renewable heat (RES-H) support usually depends on public budget, resulting stop-and-go policies, which create stronger uncertainty for investors than common in renewable electricity (RES-E), where expenditures are paid by final consumer.
    - Apply off-budget policies, e.g. building obligations or support financed via surcharge on heat (fuel) cost.
- Long reinvestment cycles limit the diffusion rate for renewable heating systems integrated in buildings.
    - Stimulate technologies beneficial for (future) system integration of variable RES-E (heat pumps or biomass/-gas heat pumps with heat storage).

Electricity sector

1. Best FIT-countries show highest effectiveness.

- Best quota countries improved performance in particular for low cost Renewable Energy Technologies (RET), e.g. wind onshore in United Kingdom, Italy, Belgium, Sweden.
- Quota is not effective in stimulating small-scale projects or higher-cost technologies. Technology-banding within the quota (e.g. UK) helps to support cost-intensive technologies like wind offshore, but not small-scale projects.
    - Separate incentives in many quota countries: Belgium minimum prices for photovoltaic, Italy FIP for photovoltaic, UK FIT for small-scale applications.
- 3. Some Member States experienced higher than envisaged growth (Spanish photovoltaic) causing high policy cost. Stop-and-go policies harm industry as a whole.
    - Feed in Tariff (FiT)/Feed in Premium (FIP) for renewable energy technologies with rapid cost reduction require frequent tariff adjustment cycles (for new projects only!) and good coordination of tariff levels with other relevant markets.
    - (Frequent) tariff adjustments based on (automatic) adjustment formulae (related to market growth) at dates known to the market sufficiently long beforehand can manage this policy cost risk without negatively affecting the investment climate"

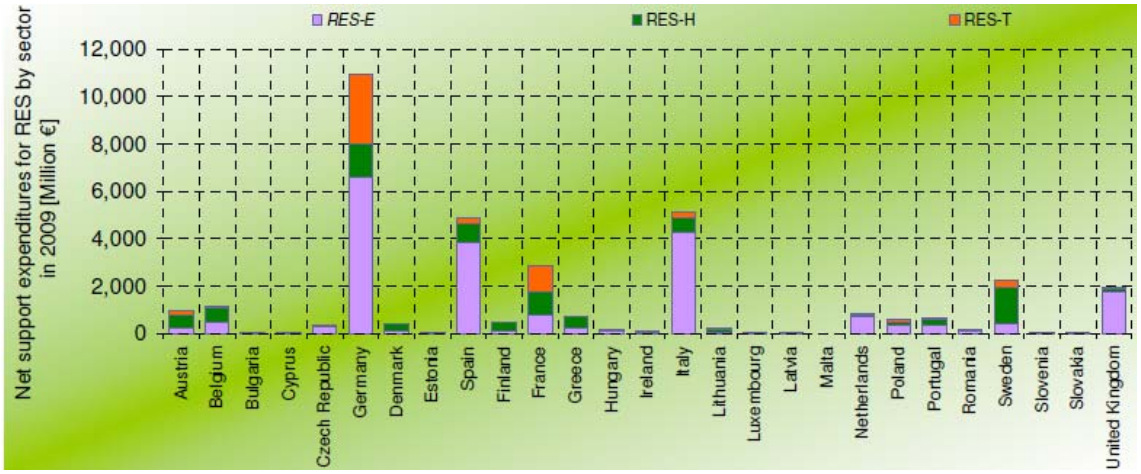
(Max Rathmann, Ecofys, 2011).

5.3. Funds evaluation

5.3.1. Support expenditures

Ecofys, in the same study, has estimated the support expenditures according to the data on the average support level for the years 2005, 2007 and 2009. These support levels have been multiplied with the amount of electricity generated in the respective technology in a certain year. For renewable power plants that have been installed between 1990 and 2005, the 2005 support level is assumed, since no time series for the time horizon before 2005 are available. In case of small-scale hydropower, it is assumed that plants, that have been built before 1990 do not receive any financial support anymore. The calculation results are presented below:

Net support expenditures for renewable energies by sector in 2009 in absolute terms



Source: Ecofys, 2011.

The most evident conclusion that can be drawn from this figure is that in absolute terms only a few countries hold a major part of the current overall net support expenditures as arising at EU level. Thereby Germany takes the “lead” with almost 11 billion €, followed by Italy and Spain with about 5 billion €. Somewhat further distant are France with about 3 billion €, followed by Sweden and the UK with both slightly more or less than 2 billion € net expenditures. Of interest, at EU level overall net support expenditures for RES in 2009 amounted to about 35 billion €.

It must be remarked that support expenditures for renewable electricity (RES-E) is paid directly by final consumer (FIT).

The support expenditures for electricity are dominant, while heating sector with exception of Austria, Denmark, Finland and Sweden, and biofuels with exception of France and Germany account only for a minor share of the total expenditures.

At electricity sector numbers given by Council of European Energy Regulators (CEER) have some differences with those from Ecofys:

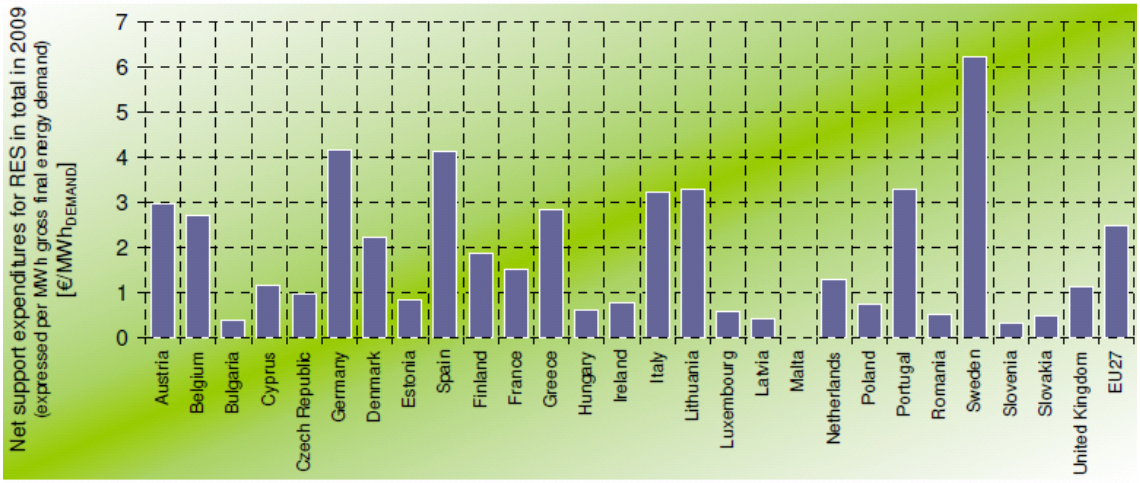
Total expenditures of Renewable Energy – electricity support schemes, 2009

Member State	RES-electricity support expenditure (million euro)	Gross electricity consumption[14] (Eurostat) (GWh)	RES-electricity support per unit of gross electricity consumed (€/MWh)
Austria[15]	307	69,584	4.42
Belgium	489	88,949	5.50
Czech Republic	150	68,595	2.19
Denmark	294	36,541	8.05
France[16]	556	516,455	1.08
Germany	5,618	520,968	10.78
Great Britain[17]	1,250	378,523	3.30
Hungary	83	41,515	2.00
Italy[18]	2,638	334,363	7.89
Lithuania	25	11,318	2.25
Luxembourg	16	7,259	2.27
Portugal	528	42,809	12.33
Spain	6,035	268,297	22.49
Sweden	478	141,884	3.37
The Netherlands	639	117,119	5.46

Source: Council of European Energy Regulators (CEER), 2011.

In order to put the numbers in a more specific perspective in next figure the support expenditures are related to the countries overall gross final energy demand. This reflects properly the burden for the energy consumer / the society arising from current renewable energy policy practice and appears well suitable for a cross-country comparison.

Net support for renewable energies per unit of overall gross final energy consumed, 2009



Source: Ecofys, 2011.

5.3.2. EU funding

At European level, despite the strong political support, policy and legal framework, the financial support given to renewables is relatively low. For the period 2007-2009, funds spent on renewable energy amounted to roughly €9.8 bn, (€3.26bn/a), mostly in the form of loans from the European Investment Bank.

In next table there is an overview on current and planned EU funding for renewable energy projects in the European Union.

Renewable energy funding programmes in EU

PROGRAMME	BUDGET ALLOCATED FOR RE IN 2009 (MILLIONS OF EUROS)	RENEWABLE ENERGY TECHNOLOGY
Sustainable Energy Initiative	138	Wind, Hydro
Technical Cooperations Funds Programme	Not available	Renewable energies and Energy Efficiency
European Local Energy Asístanse	15	Renewable energies, energy efficiency and urban transport
Intelligent Energy Europe	Not available	Renewable electricity, renewable heating and cooling, renewable energy combined heat and power biofuels
7th Framework Programme	150	Renewable energies and Energy Efficiency
EU Recovery Plan	565	Renewable energies
High Growht and Innovative SME Facility	79	Not available
SME Guarantee Facility	72	Not available
European Regional Development Fund and Cohesion Fund	680	Biomass, hydroelectric, geothermal, solar and wind
Other funds from the European Investment Bank	2,800	Mainly wind, hydroelectric and solar PV

NOTE: See the complete table in the annex.

Source: Ecofys, 2011.

The European Regional Development Funds (ERDF) and the Cohesion Fund (CF) are the most important funds on renewable energy. The expenditure planned by these funds on renewable energy for the 2007-2013 period amounts 4,760 M€. This represents a total of 680 M€ per year. The distribution by technology is 38% for biomass (255 MEuros), 24% for hydroelectric and geothermal and others energies (161 MEuros), 22% for solar (152 MEuros) and 16% for wind energy (112 MEuros).

Regarding funding aspects the EU Communication states: "*The EU instruments used directly by the Commission for financing renewable energy projects (the European Economic Recovery Package, RTD, SET Plan expenditure), those jointly managed with Member States (structural and cohesion funds), and those managed with other institutions (EBRD, EIB) will all be the subject of review in light of the forthcoming planning of the next European Financial Framework, covering EU expenditure from 2014. In this respect, the ambition to back up the political commitment of the EU to renewables needs to be underpinned with the adequate funding. In particular, the Commission will examine opportunities for using EU and national funds to leverage private capital into energy projects of European interest on local, regional, national and European levels. Further efforts are needed to facilitate the uptake of the Renewable Energy Directive's cooperation mechanisms, and so improve regional cooperation and begin the harmonised reform of support schemes.*"

6. Funding for innovative renewable energy sources

6.1. Introduction

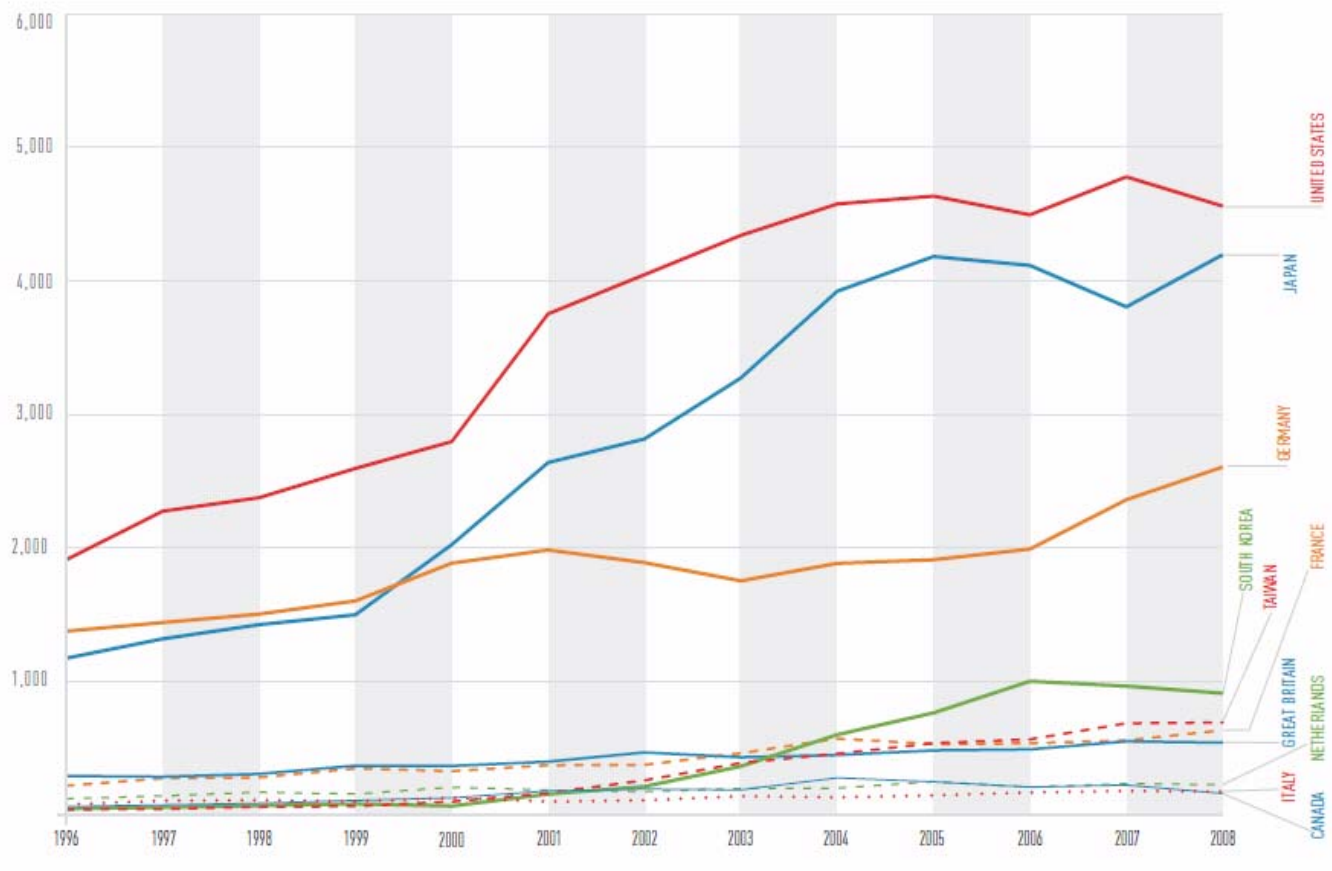
Today's critical environmental challenges and prolonged global recession have resulted in calls for a new "green" economy that could simultaneously promote sustainability, generate economic growth and create jobs. A race is on among countries and localities to become the leader in green technology.

The question for many policy makers is whether advantages in clean energy innovation will translate into high growth clean energy firms that create jobs. Past experience in other technology sectors would suggest that leading innovators will emerge as the dominant players within the industry.

To find out who's winning this race, Batten Institute from the University of Virginia has analyzed patent activity around the world to discover who is innovating in "greentech."

Greentech patenting activity by country

Number of patents granted by the world's three largest patent offices (US, EU, JP)



Source: Batten Institute, 2012.

Since 1990, the U.S., Japan and Germany have dominated greentech innovation. But the largest developing economies, including India and Brazil, have negligible rates of greentech innovation, despite being fast adopters of green technology.

Solar technology has been the focus of most greentech patents (47%), followed by biofuels (24%) and fuel cells (10%). Wind technology has seen relatively little patenting (3%), although it remains a prominent sector for annual new installations.

U.S. production of renewable energy has increased by more than 300 percent in the past decade, but the U.S. still far behind Europe and Indonesia and is only slightly ahead of Mexico in the percentage of electricity it gets from renewable sources, according to a new report from the Natural Resources Defense Council (NRDC).

Favorable governmental policies and strong private-sector investments have helped to increase the availability of renewable energy in the U.S. and elsewhere, according to Jake Schmidt, NRDC's International Climate policy director.

In 2011, new clean energy investments in the G20 countries increased to $160 billion, according to Bloomberg New Energy Finance.

With regard to Europe, some observers question whether renewables will continue growing in this region given the ongoing financial issues and a number of governments reducing renewable incentives. Some experts' conclusions raised the idea that a period of low government spending could favour continued growth of renewables. Why? With limits on spending, governments are reluctant to support big-ticket capital investments in generation whether by government utilities or the private sector. This works against investments in nuclear, coal with carbon capture and even gas units since they will require investment in new gas pipelines and/or LNG import terminals if too many are built. Conversely, renewables can keep adding capacity in smaller increments. Ongoing growth in renewables could allow politicians to avoid making decisions on highly visible large capital expenditures until suddenly there is so much renewable power that other projects are not needed.

However, it is necessary to take into account that some 80% of the total energy subsidies in the EU-15 are paid to fossil fuels and nuclear energy according to the European Environment Agency, while just 19% goes to renewables. For every $1 of government support given to renewable energy around the world, at least $5 are given to fossil fuels, according to the International Energy Agency.

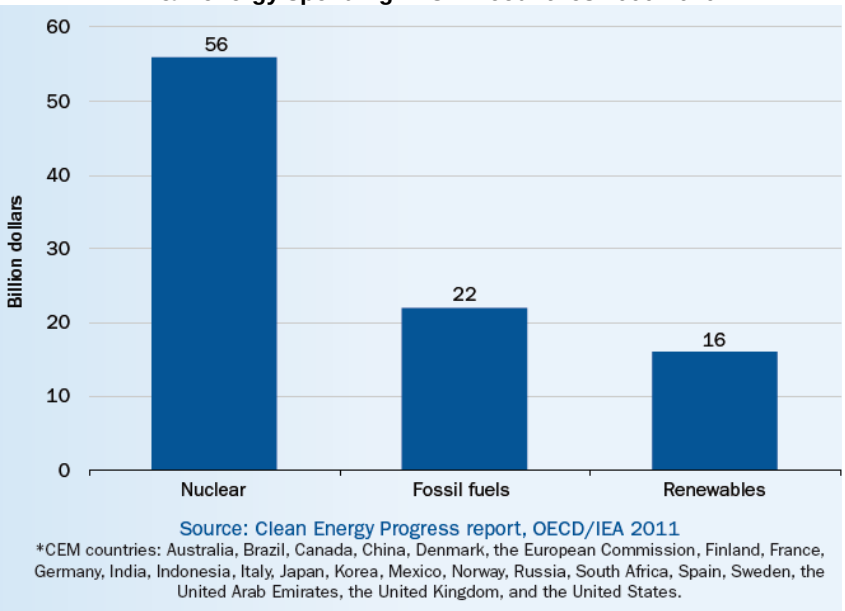
6.2. Public spending on research, development and demonstration for renewable energy in the world

Renewable energy Research, Development and Deployment (RD&D) comprises solar, concentrated solar power (CSP), solar heating and cooling, wind, hydropower, geothermal electricity and heat, production and use of biomass and waste (including liquid biofuels and biogas), and other renewable technologies such as ocean and wave/tidal power.

Overall, there was a significant threefold increase in CEM countries' RD&D expenditures on renewable energy between 2000 and 2010. In 2010, there was a large decrease to USD 3.1 billion total spending from 2009's all time high of USD 3.8 billion due to reductions in stimulus spending.

However, estimates for 2011 indicate that spending regains momentum as more data become available from a wider range of countries. Between 2000 and 2010, countries spent USD 56 billion on nuclear energy and USD 22 billion on fossil fuels RD&D, this compares to renewable technologies for which CEM countries spent only USD 16 billion over the same time period.

RD&D energy spending in CEM countries 2000-2010



The United States is the largest spender on renewable energy RD&D among CEM countries.

Between 2005 and 2010, the United States spent USD 4.9 billion, representing 40% of the total spent by all countries. In addition, the US spending amount increased significantly compared to the first half of the decade, when the country spent USD 1.4 billion (2000-2005). In 2011, the United States has made a significant increase in solar energy RD&D, especially CSP (USD 141 million) which represents as much as 12% of total renewable technologies RD&D for this year. Japan and Australia increased expenditures on solar energy; each country spent about USD 145 million in 2011.

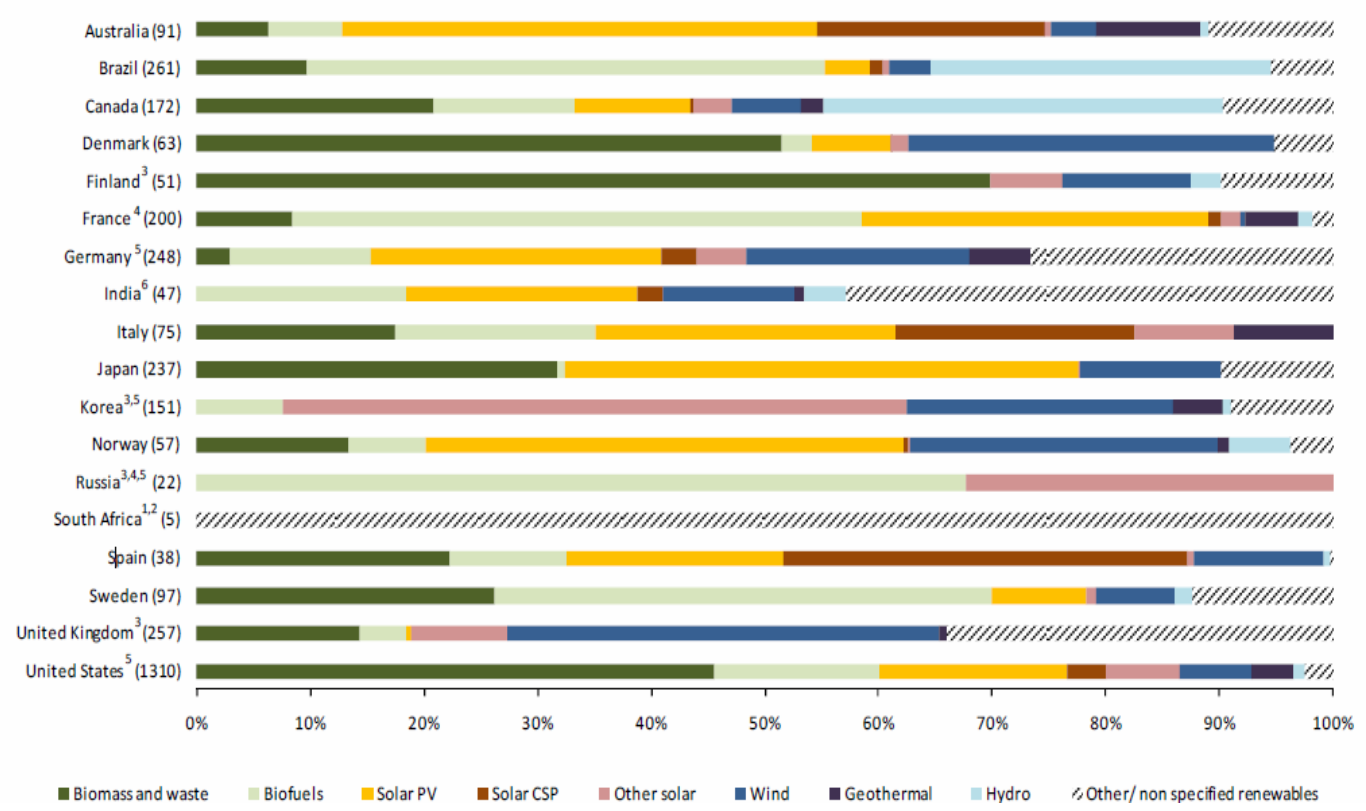
For total biomass, the United States also leads RD&D expenditures with USD 2.6 billion between 2005 and 2010, followed by Brazil, Japan and Canada, who spent together more than USD 1 billion in this time period. For non-IEA countries other than Brazil, Russia spent some estimated USD 46 million on biomass between 2007 and 2009 (including biofuels). India spent around USD 100 million between 2000 and 2008 on solar, wind, small hydro and biogas technologies RD&D but no specific rates are officially available (Kempener *et al*., 2010).

Approximately India plans to spend USD 43 million on bioenergy between 2007 and 2011 out of a total renewable energy RD&D budget of USD 237.

Generally, there are no detailed data breakdowns available for large emerging countries on renewable energy RD&D spending. As these countries develop a growing number of initiatives to increase renewable energy, it will be important to improve RD&D spending data for these countries.

Brazil, Korea, Japan, Russia, the United Kingdom and the United States have made special efforts to submit more detailed RD&D data on subsectors. This allows for important insights upon priorities and trends in these countries.

Public spending on renewable energy RD&D (2010 USD million)



Source: OECD-IEA, 2011.

6.3. NER300: The European funding programme for innovative renewable energy technologies

The NER300 is a European programme to finance demonstration projects for renewable energies in the climate change policy framework. Specifically, the programme was established by Article 10a(8) of the EU Emissions Trading Directive, and further developed through Commission Decision 2010/670/EU ("NER300 Decision"). It covers 300 million allowances from the new entrants reserve of the third phase of the EU Emissions Trading System for the co-financing of innovative renewable energy technologies -as well as commercial demonstration projects of environmentally safe carbon capture and geological storage (CCS) - in the territory of the EU. The allowances will be sold on the carbon market and the money raised -which could be 4.5 bn EUR if each allowance is sold for 15 EUR- will be made available to projects as they operate.

NER300 funding programme aims to provide 50% of relevant costs. Relevant costs of RES demonstration projects shall be those extra investment costs which are borne by the project as a result of the application of an innovative renewable energy technology net of the net present value of the best estimate of operating costs and benefits arising during the first 5 years compared to a conventional production with the same capacity in terms of effective production of energy[6].

No project will receive funds corresponding to more than 15% of the available allowances over the two rounds of calls for proposals. In case the funds should amount

[6] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:290:0039:01:EN:HTML

to €1.3 billion the 15 % cap would amount to €292 million, with €1.5 billion the corresponding cap would be €337 million.

By end June 2012, the European Investment Banks had sold some 140 million allowances for delivery in December 2013. This raises some € 1.14 billion upon delivery in December 2013. The average price per allowance sold so far has been € 8.05.

NER300 money will be paid out to renewable energy installations as they produce energy, supplementing whatever other support they might benefit from, like green certificates or feed-in tariffs. The justification for the additional subsidy is that it will hasten the deployment of new technology and that it will ensure that knowledge about the functioning of this new technology is put in the public domain.

Calculating the maximum subsidy that NER300 can provide to a particular project is not easy.

An innovative technology project, however, carries risk: the project might fail to meet its production schedule, therefore meaning that it does not receive all the NER300 subsidy it had expected. NER300 allows for some underperformance. This is reflected in the rate of disbursement of the subsidy. Renewable energy installations need only achieve 75% of the total energy production that they bid for the first five years of operation in order to receive their subsidy in full.

Upfront funding may be made available depending on available revenues to accelerate final investment decisions and entry into operation of projects to the extent possible. In case a project e.g. fails to enter into operation or ceases operation, Member States will have to recover and return any excess funding.

As the European Renewable Energies Federation points, *"the NER 300 is a useful tool, but it is not and cannot be able to replace stable framework conditions and markets adapted to the needs of a renewable energies based energy system"*.

Actors

The European Commission, the Member States and the EIB will share responsibility for managing the NER300 instrument. The Commission is responsible for the overall implementation of the NER300 programme. Projects developers apply to the Member State in which they want to situate their project. Each Member State chooses from the project applications it has received and passes one on to the EIB for consideration in the selection process. Acting as an agent of the Commission, the European Investment Bank (EIB) examines the submitted bids and is also responsible for monetising the allowances as well as for providing funding to the Member States for disbursement to the project sponsors.

Eligible Renewable Energy technologies

The programme intends to support a wide range of carbon capture and geological storage (CCS) and renewable energy technologies, the latter including bioenergy, concentrated solar power, photovoltaics, geothermal, wind, ocean, hydropower, distributed renewable management categories.

Two rounds

The funds generated from 300 million allowances are distributed through two rounds of calls for proposals, covering 200 and 100 million allowances, respectively. The first call for proposals was launched in November 2010. The Commission aims to adopt award

decisions to Member States for successful projects by end 2012. All NER300 projects will need to be operational by the second half of 2016. The NER300 rules foresee that no Member State can be host to more than three projects over the two rounds.

First call

The first call for proposals of the NER300 funding programme received a strong response from project sponsors and Member States. In May 2011, a total of 79 project proposals, including 13 CCS and 66 renewable energy sources (RES) proposals, from 21 Member States, were submitted to the EIB for further assessment. The total amount of funding requested was €11.8 billion. However, under the ongoing first call for proposals, some 3 carbon capture and storage (CCS) demonstration projects and up to 16 innovative renewable energy demonstration projects could be co-funded.

Candidates for award decisions

Sweden is line to receive funding for three proposals, the UK and Greece for two apiece and Belgium, Portugal, France, Finland, Czech Rep., Germany, Austria, Italy, Poland and the Netherlands for one each.

7. The development of public support for renewable energy sources

7.1. Global Trends in Renewable Energy Investment

The momentum of clean energy investment over recent years has been strong, but there have been many jolts and bumps on the way, as the detail of the following figure shows. These have included the biofuel boom of 2006-07 and subsequent bust, resulting in a fall in financial new investment in that sector from a peak of $20.4 billion in 2006 to just $5.5 billion last year; and the impact of the financial crisis and recession on Europe and North America.

Financial new investment in renewable energy was significantly lower in 2010 in both Europe and North America, although this setback was more than out-weighed by growing investment in China and other emerging economies, and in small-scale photovoltaic (PV) projects in the developed world.

Particularly in Europe, the growth of financial new investment in 2009-2010 was -22%, whilst compounded annual growth rate during 2004-2010 was 25%.

Financial New Investments by Geography

	2004	2005	2006	2007	2008	2009	2010	2009-2010 Growth %	2004-2010 Compounded Annual Growth Rate %
Europe	9.0	18.4	27.3	46.6	17.6	45.0	35.2	-22	25
North America	3.8	10.3	24.6	29.4	32.3	19.7	30.1	53	41
South America	0.5	2.8	4.7	7.7	15.7	9.4	13.1	39	70
Asia&Oceania	5.6	11.0	18.3	26.2	34.4	45.7	59.3	30	48
Middel East&Africa	0.3	0.1	1.5	1.5	2.4	2.4	5.0	104	57
Total	19.0	43.0	76.0	111.0	132.0	122.0	143.0	17	40

Source: UNEP, Bloomberg, 2011.

In 2011, the biggest reductions in terms of absolute dollars came in US wind and European solar. March 2011 brought a tragic event with potentially far-reaching consequences for energy, including renewables. The Japanese earthquake, and the ensuing crisis at the reactors at Fukushima Daiichi, cast into doubt the future of nuclear power in Japan and also in other countries such as Germany. Initially, this led to a sharp rise in the share prices of renewable energy companies. But it could be that gas-fired generation will be the prime, short term beneficiary of nuclear's problems, not renewables.

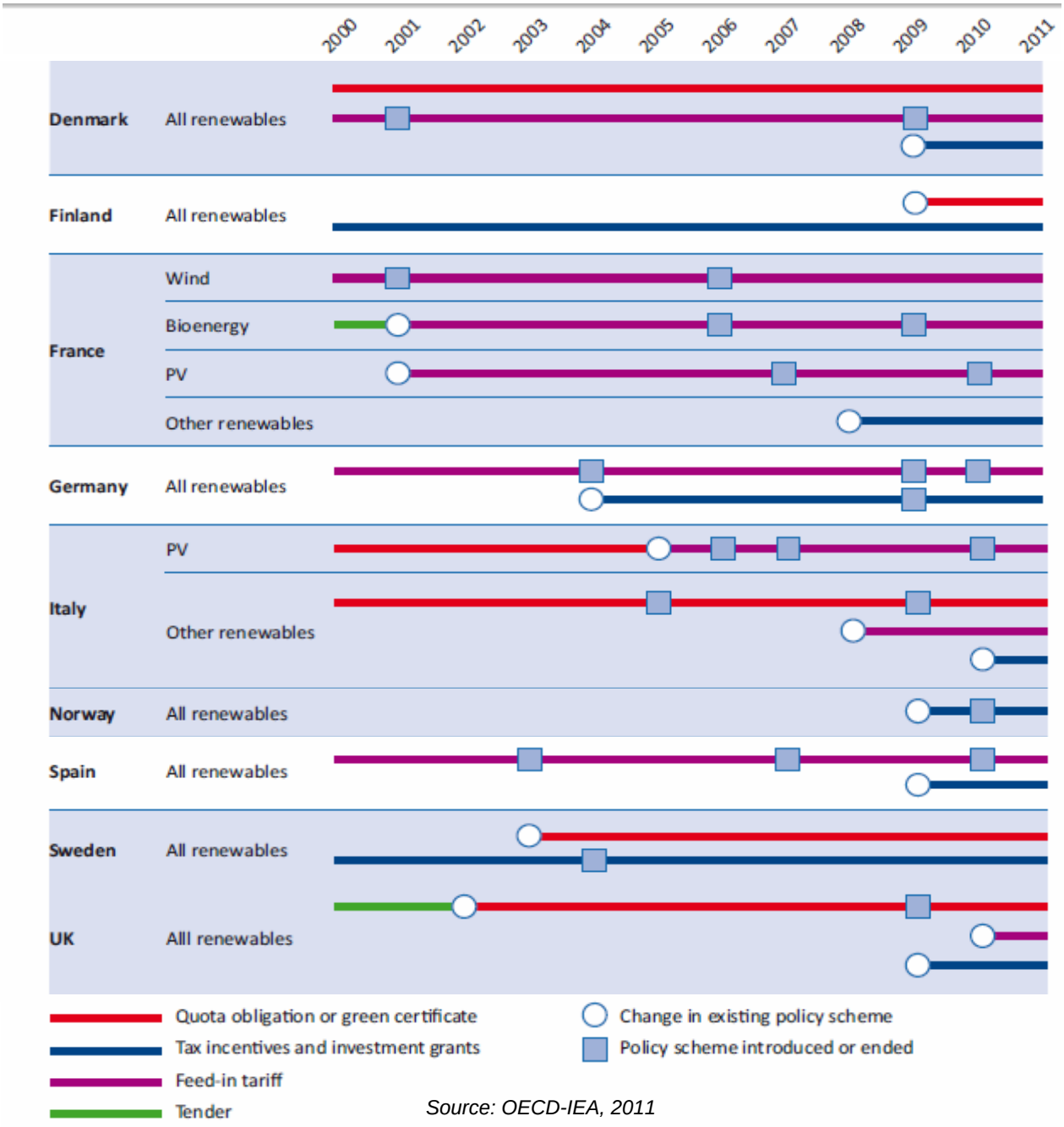
7.2. Evolution of renewable electricity support schemes in Europe

In 2010, almost all major economies in the world had some form of support scheme for renewable electricity; this stands in contrast to 2000, when only 16 countries provided targeted support.

The following table also illustrates the growing number of changes in policy support and adaptations to existing schemes in main countries in Europe.

In 2010 and in the beginning of 2011, a number of countries adapted photovoltaic feed in tariff schemes, with the Czech Republic, Spain, France, Italy, UK and Germany revising policies and tariff rates given unexpected rapid growth that resulted in escalating policy cost.

At the present, 15 Member States now offer market oriented feed in premium or tradable green certificate support schemes.



Source: OECD-IEA, 2011

Recent changes in RES support

The cost of renewable energy is not determined solely by wind, solar, biomass or water resources; project costs are also driven by administrative costs and capital costs. Complicated authorisation procedures, the lack of one-stop-shops, the creation of registration procedures, planning processes that may take months or years and fear of retroactive changes to support schemes, increase project risk. Such high risks, particularly, in countries with stressed capital markets, result in a very high cost of capital, raising the cost of renewable energy projects and undermining their competitiveness.

Thus simple administrative regimes, stable and reliable support schemes and easier access to capital (for example through public supports schemes) will contribute to the competitiveness of renewable energy. In that context, the European Investment Bank and national public institutions can play a key role.

Today, most renewable energy technologies benefit from national support schemes, but only a small share of the energy market is affected: less than a third of the 19% of our electricity from renewable energy is sheltered from market prices. In the transport sector, all forms of alternative fuels from renewable energy sources can count towards the 10% transport target, although development is held back by high prices of related transport systems and insufficient fuel infrastructure. Biofuel blending obligations are common and biofuels constitute around 4% of transport fuels. The costs are in principle passed on to consumers by fuel suppliers. In the heating and cooling sector (some 13% of which is from renewable energy sources), support for some mature markets and technologies (e.g. solar thermal) has been abolished.

Mature technologies operating in competitive markets, with a well-functioning carbon market should ultimately no longer need support. However, some form of R&D and other financial or administrative support may continue to be needed for newer, less mature technologies. Thus certain cost effective and well-targeted support schemes may still be necessary beyond 2020. A good example of such a support scheme is the "NER 300" which uses auction revenues from the EU emissions trading scheme to trigger demonstration and early deployment of innovative renewables technologies.

On the way, in every Member State, support schemes are being adjusted. Member States are reforming and improving their support schemes in order to reflect decreasing costs of renewables and to encourage greater competitiveness on the part of renewable energy. However, they also need to avoid creating uncertainty and thereby discouraging investment from occurring. Recently a number of Member States have undertaken reforms that have caused disruption to industry and investors, for instance[7]:

- Stopping biofuel blending after only recently having introduced it.
- Avoiding legal constraints in cutting PV tariffs by imposing a levy instead, cutting expected returns to existing investors/producers retroactively.
- Reducing tariffs for most existing energy producers without notice.
- Proposals to apply new lower tariffs in exchange for an existing green certificate scheme, again, retroactively applied to existing producers.
- Ad hoc deferral of direct aid payments for biofuel production.
- Changes to an existing green certificate regime regarding technology eligibility and duration, directly affecting the price of green certificates for existing producers.

[7] *According to the document "SWD (2012) 163 final and 149 final", that accompanies the Communication "Renewable Energy: a major player in the European energy market".*

- A moratorium on support for new renewable energy production, which has an obvious direct and crushing impact on local renewable energy investment.
- Modifications of feed in tariffs for existing producers, cutting expected returns to investors significantly.
- Changes to timetables applying new, lower tariffs before announced or legally possible.
- Adding complicated project registration procedures to the authorisation process.

Recent changes to support schemes have in some cases been triggered by unexpectedly high growth rapidly increasing expenditure on renewable energy which is not sustainable in the short term. In some Member States, changes to support schemes have lacked transparency, have been introduced suddenly and at times have even been imposed retroactively or have introduced moratoriums. For new technologies and investment still dependant on support, such practices undermine investor confidence in the sector.

Best practices in the design, structure and reform of support schemes should strike a balance between certainty and sufficient incentives to invest in new technologies, on the one hand; and avoiding overcompensation on the other. If the scheme is flexible and able to adapt to changing market and economic circumstances (cost reductions, fiscal constraints, excess production), forced or unexpected changes are not necessary. Thus schemes with planned forms of automatic tariff digression with clear rules for support evaluation and revision are able to provide revenue stability to producers whilst introducing a quantity constraint on production.

Moreover diverging national support schemes, based on differing incentives may create barriers to entry and prevent market operators from deploying cross-border business models, possibly hindering business development. Applying criteria commonly across Member States could also increase coherence and convergence of approach and thus reduce distortions arising from different national support schemes.

It is to further promote the application of best practice and avoidance of bad practice that the Commission intends to prepare and publish guidance on renewable energy support schemes to avoid fragmentation of the internal market.

8. Main expectations of RE sector by 2020

8.1. Progress towards 2020 targets in RE in 2010

In 2007 the European Union set the ambitious goal of achieving a 20% share of renewable energy and a 10% share of renewable energy in transport by 2020 and has flanked these objectives by a series of supporting policies -administrative reforms, grid rules and 10 year national renewable energy action plans (NREAP)-. The renewable energy goal is a headline target of the Europe 2020 strategy for smart, sustainable and inclusive growth. At the start of 2012, these policies are beginning to work and the EU is currently on track to achieve its goals. In 2009 and 2010 renewable energy growth increased significantly. Indeed, the EU had already reached its first interim target for 2011/2012 (10.7) in 2010[8]; the RES in consumption was 12.5% and the RES in transport was 4.7% in the same year.

In their compliance with the measures set out in the Renewable Energy Directive National and the National Renewable Energy Action Plans, the Member States periodically describe the overall renewable energy policy developments and communicate the conclusions to the European Commission every two years. The last available data show the progress towards 2020 targets in Renewable Energy in 2010 at the national level. All the Member states have reached or rose above their renewable energy interim targets for 2011/2012, except Ireland, Cyprus, Latvia, Luxembourg, Malta, Netherlands and United Kingdom.

Member States' Progress Towards 2020 Targets in Renewable Energy

MS	RES in Consumption in 2010 (1)	2011/2012 RES Interim Target (1)	2020 RES Target (1)	RES in Transport (2010) (2)	2020 RES Target in Transport (2)
EU	**12.5%**	**10.7%**	**20%**	**4.7%**	**10%**
Belgium*	5.16%	4.4%	13%	4.33%	10%
Bulgaria	13.79%	10.7%	16%	1.00%	10%
Czech Republic	9.24%	7.5%	13%	4.58%	10%
Denmark	22.22%	19.6%	30%	0.27%	10%
Germany	11.00%	8.2%	18%	5.73%	10%
Estonia	24.32%	19.4%	25%	0.17%	10%
Ireland	5.46%	5.7%	16%	2.39%	10%
Greece	9.24%	9.1%	18%	1.93%	10%
Spain	13.83%	10.9%	20%	4.73%	10%
France	12.93%	12.8%	23%	6.10%	10%
Italy	10.11%	7.6%	17%	4.81%	10%
Cyprus	4.85%	4.9%	13%	1.97%	10%
Latvia	32.57%	34.0%	40%	3.32%	10%
Lithuania	19.72%	16.6%	23%	3.59%	10%
Luxembourg	2.83%	2.9%	11%	2.04%	10%
Hungary	8.68%	6.0%	13%	4.74%	10%
Malta	0.36%	2.0%	10%	0.30%	10%
Netherlands	3.76%	4.7%	14%	3.01%	10%
Austria	30.05%	25.4%	34%	5.45%	10%
Poland	9.41%	8.8%	15%	5.94%	10%
Portugal	24.57%	22.6%	31%	5.59%	10%
Romania	23.36%	19.0%	24%	3.19%	10%
Slovenia	19.80%	17.8%	25%	2.87%	10%
Slovakia	9.76%	8.2%	14%	7.85%	10%
Finland	32.17%	30.4%	38%	3.90%	10%
Sweden	47.94%	41.6%	49%	7.75%	10%
United Kingdom	3.20%	4.0%	15%	2.96%	10%

* Belgium 2010 Data: Estimated by Eurostat. Source: Eurostat June 2012 and Directive 2009/28/EC for Targets. (1): Share of Renewable Energy in Gross Final Energy Consumption. (2): Share of Renewable Energy in the Transport Sector.

[8] European Commission (2012). Communication "Renewable Energy: a major player in the European energy market".

8.2. Future perspectives to meet renewable energy targets by 2020

A report released by the **European Renewable Energy Council (EREC)**[9] at the beginning of 2011, forecasted that EU Member States will collectively meet/exceed the binding target of 20% renewable energy as a share of final energy consumption by 2020. This includes heat, transport and electricity generation.

The share of renewable energy sources in electricity consumption is predicted to increase to 34.3% in 2020, with wind energy representing 14%, hydropower 10.5%, biomass 6.6%, photovoltaics 2.4%, concentrated solar power 0.5%, geothermal energy 0.3% and ocean energy 0.2%.

Renewable heating and cooling should reach 22.2% in 2020, with biomass representing 17.2%, heat pumps from aerothermal and hydrothermal energy 1.6%, solar thermal energy 1.2% and geothermal energy 1.3%.

The share of renewables in transport is forecast to reach 11.27% of diesel and petrol consumption in 2020.

25 out of the 27 National Renewable Energy Action Plans submitted to the European Commission expect to reach or exceed their 2020 targets domestically. EREC calculations show that 15 Member States expect to exceed their 2020 binding targets (AU, BG, CZ, DE, DK, EL, ES, PL, HU, LT, MT, NL, SE, SL, SK). Only Italy and Luxembourg plan to resort to cooperation mechanisms to achieve their 2020 goals.

Another report published by the **Joint Research Center** [10] at the end of 2011, shows that, according to the National Renewable Energy Action Plans (NREAPs), Member States plan to reach an overall share of 20.7% of energy from renewable sources by 2020.

The JRC's assessment shows that almost half of the Member States are planning to exceed their own targets and will therefore be able to provide surpluses for other Member States.

Overall, the share of electricity from renewable energy sources in the EU is planned to reach 34% (up from 15%) for electricity generation, 21.4% (up from 10%) for the provision of heating and cooling, and 11.7% (up from 1.4%) for transport.

The renewable energy sources mix is composed of biomass and biofuel (almost 60%), hydro energy (12%), onshore wind (12%), offshore wind (12%), photovoltaic (2.3%) and solar thermal (2.4%).

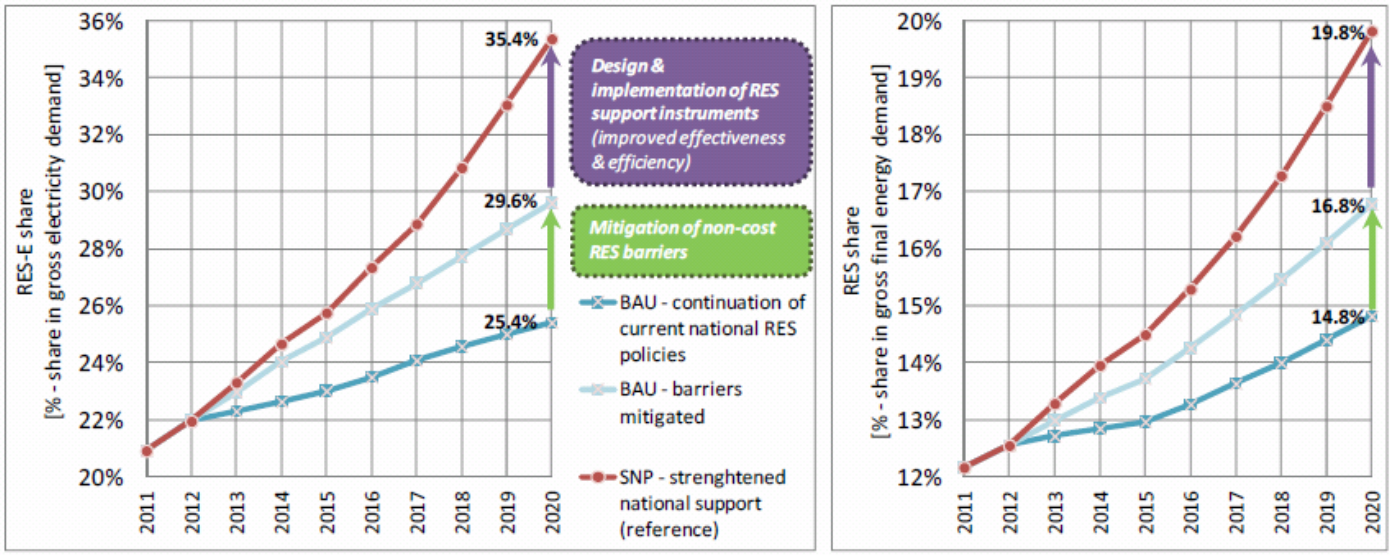
In RES electricity, wind has the highest contribution followed by hydro and biomass. In RES Heating and Cooling, the main source is biomass with 81%, also in RES transport with a share of 88% (biodiesel 66% ethanol 22 %).

[9] The European Renewable Energy Council is coordinating the REPAP2020 project, which aims to facilitate the national implementation of the Renewable Energy Directive (RES Directive).

[10] JRC,2011. *Technical Assessment of the Renewable Energy Action Plans*.

According to the **"RE-shaping"[11] study** of the beginning of 2012, with currently implemented renewable energy sources (RES) support –*"business-as-usual" (BAU) scenario*– it can be expected that the majority of EU countries will fail to trigger the required investments in new RES technologies needed for the 2020 RES target fulfilment. The renewable energy share would be 14.8% (instead of 20%) and the renewable electricity (RES-E) would cover 25.4% of gross electricity demand.

Results of RES deployment and related support expenditures at EU level



NOTE. RES-E (left) and RES (right) deployment (expressed as share in gross electricity demand (left) / gross final energy demand (right)) in the period 2011 to 2020 in the EU-27 according to the BAU case (incl. a sensitivity variant of mitigated barriers) and the (default) case of "strengthened national policies"

Retaining current financial RES support, supplemented by a mitigation of non-economic deficits -*"Mitigation of non-cost RES barriers scenario"*-, would allow for a 2020 renewable electricity share of 29.6% of gross electricity demand (compared to 25.4% as default). The corresponding figure for RES in total is 16.8% of gross energy demand (instead of 14.8% as default).

For renewable electricity the direct improvement of the efficiency and effectiveness of the underlying support instruments -*"Strengthened support instruments scenario"*- leads to an increase of the renewable electricity share from 29.6% (BAU with removed barriers) to 35.4% ("strengthened national policies"). For RES in total, the impact on deployment is of similar magnitude, i.e. an increase of the RES share of gross final energy demand from 16.8% to 19.8%.

Complementary to this, the following table depicts the corresponding yearly RES support expenditures required for the three scenarios.

[11] Ragwitz et al, 2011. *"Shaping an effective and efficient European renewable energy market".* Fraunhofer Institute for Systems and Innovation Research (ISI), coordinator.

RES(-E) deployment by 2020 and corresponding support expenditures for researched cases (from BAU to strengthened national policies)

Key figures for researched cases - from BAU to strengthened national policies			Resulting deployment by 2020		Yearly consumer expenditures by 2020	
Scenario		Corresponding measures	RES-E share in gross electricity demand [%]	RES share in gross final energy demand [%]	RES-E support [Bill.€]	Support for RES in total [Bill.€]
1	BAU - continuing current national support		25.4%	14.8%	51	78
2	BAU with barriers mitigated	(1 --> 2) Mitigation of non-economic RES barriers	29.6%	16.8%	56	87
3	SNP - Strengthened national policies	(2 --> 3) Improvement of design and imple-mentation of RES support instruments	35.4%	19.8%	56	82

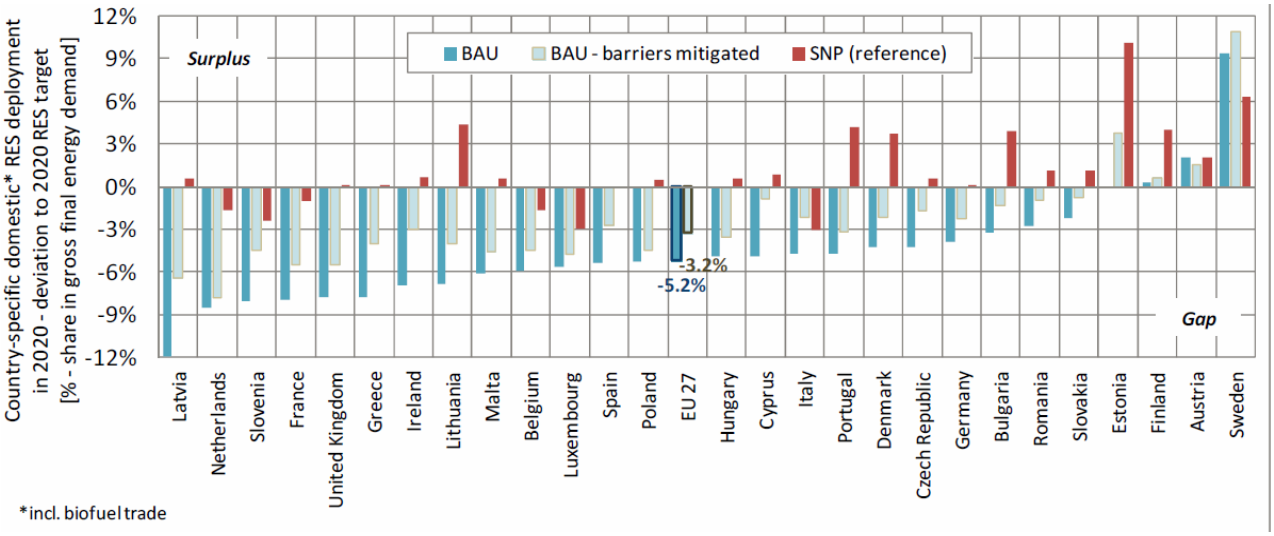
Ragwitz et al, 2011

In conclusion, if the EU will fail to meet its 2020 RES commitment by retaining currently implemented national RES support instruments without further adaptation, the forecasts could be even worse if these support instruments are removed or changed.

But how do individual Member States perform? The majority of Member States will fail to deliver the required RES deployment in 2020 if no further measures or adaptations are taken[12]. Only four out of 27 countries, i.e. Sweden, Austria, Finland and Estonia, may succeed in (over)fulfilling their 2020 RES targets with RES policies in place under the current framework conditions. In contrast, Latvia, Netherlands, Slovenia, France, UK, Greece, Ireland, Lithuania and Malta are those countries with a gap higher than 6% (of gross final energy demand) under BAU conditions.

On average, at EU level, a gap of 5.2% (of gross final energy demand) occurs in the BAU case. The picture improves if non-economic barriers are mitigated, and at EU level the gap decreases to 3.2%. This leads to a significant improvement in the majority of Member States. However, in a few countries, such as the Netherlands, Malta, Belgium, Luxembourg, Hungary and Portugal, changes arising from the removal of non-economic barriers are less pronounced which underpins the need to strengthen the financial support offered. Complementing this, the results of the case of "strengthened national RES policies" show that cooperation is a key necessity for several Member States. This is at least the case if Member States aim for an effective and economically efficient RES target fulfilment.

[12] It is assumed that currently implemented RES policies remain in place. Note that only RES policies as implemented by January 2011 (as reported in the RE-shaping RES policy country profiles as of March 2011, see Rathmann et al. (2011) are taken into consideration. Planned measures as described in the NREAPs are consequently ignored if not implemented as at this date.



Ragwitz et al, 2011

8.3. European debate about the renewable energy financial support post-2020

At the end of 2011, the European Commission launched a public consultation[13] in the area of the renewable energy strategy in the EU to examine the conditions that might be necessary for a further development of renewable energy in a medium term perspective – i.e. until 2030. This would cover the three pillars of energy policy (sustainability, security of supply and competitiveness) and be consistent with the long-term decarbonisation scenarios presented in the 2050 Roadmap which all point to a substantially increased share of renewable energy sources.

The consultation therefore centred on the question to what extent and in which form policy interventions on EU and national levels will continue to be needed after 2020, respectively how the present approaches should be adapted.

One of the main sections of this consultation refers to the further development of support mechanisms post-2020. Incentive schemes can take various forms from quantitative targets (on various levels) to fixed price schemes, administrative reform and R&D support. All of these have their specific benefits and costs; moreover there is a link to the degree of maturity of the individual technology and the degree of exposure to market mechanisms that is considered appropriate.

Replies on the need for financial support post-2020 showed that respondents see a need for a more differentiated approach in that time frame. A majority considered that support should be available for selected technologies (57%) whereas only 13% favoured phasing out all support for renewables post-2020. Most respondents predicted that some renewables technologies would be competitive in that time frame and support should therefore be targeted to those which will not have reached this stage yet. Operative support could be provided for those relatively close to the market whereas at the very initial stage of development R&D support might according to some respondents be more appropriate. Technologies mentioned most often in this context

[13] European Commission public consultation "Renewable Energy Strategy". http://ec.europa.eu/energy/renewables/consultations/20120207_renewable_energy_strategy_en.htm

were various forms of ocean energy as well as geothermal. Offshore wind, new solar applications as well as second generation biofuels were also mentioned.

As for the conditions under which support for renewables continued to be justified, the absence of full internalisation of external costs, including through a robust carbon price, as well as removal of all subsidies for conventional generation were most often mentioned. On the other hand, some respondents argued that limits to renewables support should be defined ex-ante e.g. in terms of deployment volume, market penetration or time frame.

Replies on the need for more common approaches towards support schemes were quite mixed. As to the level of support 36% considered these should remain under exclusive national control, 22% considered benchmark values for support at national level appropriate and 27% argued in favour of EU-level benchmarks. The support for EU-wide benchmarks was slightly higher among industry respondents than on average (34%). On the other hand, more than two thirds of public authorities responded that support should remain under exclusive national control. For the structure of support more respondents rejected EU-wide alignment than supported it (45% over 37%). Again, strongest opposition to alignment came from public authorities (67%), followed by NGOs (46%), whereas a slight majority of industry respondents favoured structural alignment (43% over 40%).

In general there was wide support for making support schemes more market-oriented. As to which support schemes are most distortive, the majority of respondents avoided a response with explicit reference to generic support types, but rather referred to abstract principles and stressed that distortions were highest in case of over-compensation, respectively lack of proper downward adjustments of support levels. Nevertheless a number of respondents stressed the importance of exposing renewables to market price signals in order to reduce distortions and mentioned a move from feed-in tariffs to feed-in premiums as a step in the right direction. Some respondents also referred to priority access rules as well as non exposure of renewables to balancing risk as specifically distorting elements.

9. Conclusions and key messages

- The European Union promotes the change of energy model through its Directive 2009/28/CE on the promotion of the use of energy from renewable sources which sets three compulsory goals for all Member States for 2020: a 20% reduction of greenhouse gas emissions, a 20% reduction of primary energy consumption through energy efficiency and a total share of 20% of renewable energy in final gross energy consumption, as well as a 10% share of renewable energies in transport.
- According to Eurostat figures, the primary production of renewable energy in the EU-27 in 2009 was 148.4 million tonnes of oil equivalent (toe) – an 18.3 % share of total primary energy production. The volume of renewable energy produced in the EU-27 had an overall increase of 60.2 % between 1999 and 2009, equivalent to an average increase of 4.8 % per annum.
- Renewable energy share of gross final energy consumption in the EU-27 was 12.4% in 2010 (11.5% in 2009). The countries with highest share of renewables are Sweden, Latvia, Finland, Austria and Portugal –see figure below-. Renewable energy share in total electricity consumption was 19.8% in 2010 (18.2% in 2009) and the RE share of gross inland energy consumption was 9.9% in 2010 (9.1% in 2009)[14].
- The economic activity of the 27 European Union Member States for 2010 stemming from renewable energies is valued in more than 127 billion euros – a 15% improvement on the 2009 figure of 120 billion euros. The photovoltaic sector shows an excellent performance with sales of 45,564 million euros in Europe's markets, which ranks it as top earner outperforming wind power. Photovoltaic is followed by the wind power and solid biomass sectors.
- Germany leads Europe in sales (36,860 million €). Italy (16,164 million €), France (12,602 million €) and Sweden (10,158 million €) follow Germany in turnover.
- The recent report *"The State of Renewable Energies in Europe"*, published by EurObserv'ER in the beginning of 2012, found that the renewable energy sectors have more than 1,114,000 employees in the 27 European Union Member States. This is a 25% increase on the 2009 figure (912,220).
- The major employer is solid biomass with more than 273,000 jobs (direct and indirect full time jobs), followed by photovoltaic and wind power with respectively 268,110 and 253,145 jobs estimated for 2010. Business in the photovoltaic sector surged in 2010, which led to a 50% increase in job numbers and in countries as Germany, France and Italy jobs expanded by 70% or even more.
- Germany (361, 360 workers) still holds an undisputable lead over its nearest rivals in the jobs league with more than twice as many jobs as in France (174,735 workers) and over three times as many as in Italy (108,150 workers). Spain ranks fourth (98,300), followed by Sweden (54,780 workers) -see annex-.
- According to a Commission's study[15] in 2009, reaching the 2020 renewable energy targets is expected to lead to around 2.8 million jobs in the renewable energy sector and generate a total value added of around 1.1% of GDP and 3.4 million employees by 2030.
- In the "*A 100% Renewable Energy Vision for the European Union"* report, the European Renewable Energy Council estimate that a target of 45% renewable

[14] These figures were published by Eurostat, the statistical office of the European Union in connection with the EU Sustainable Energy Week in 2012, which promotes energy efficiency and renewable energy.
[15] Ragwitz, M. et al (2009).

energy in final energy consumption in 2030 is met, this would provide gross employment of about 4.4 million in the renewable energy sector – an annual average growth rate of about 6% on 2020 (2.7 million employees). If a target of 100% renewable energy by 2050 was followed, employment in the renewable energy sector would bring 6.1 million people into work.

- Most experience with supporting RES is available in the electricity sector, where the EU Directive 2001/77/EC required Member States to increase the share of renewable energy sources in electricity using national support instruments.
- Support for renewable heating and cooling is mainly based on investment grants and partly tax exemptions. In the transport sector most MS use a combination of an obligation with tax exemptions. In Europe, main support schemes are feed-in tariffs, feed-in premium and quota obligation.
- According to Ecofys, in absolute terms only a few countries hold a major part of the current overall net support expenditures (electricity, heating and transport) as arising at EU level. Thereby Germany takes the "lead" with almost 11 billion €, followed by Italy and Spain with about 5 billion €. Somewhat further distant are France with about 3 billion €, followed by Sweden and the UK with both slightly more or less than 2 billion € net expenditures. Of interest, at EU level overall net support expenditures for RES in 2009 amounted to about 35 billion €.
- The support expenditures for electricity are dominant, while heating sector with exception of Austria, Denmark, Finland and Sweden, and biofuels with exception of France and Germany account only for a minor share of the total expenditures. It must be remarked that support expenditures for renewable electricity (RES-E) is mostly paid directly by final consumer through FIT.
- At electricity sector numbers given by Council of European Energy Regulators (CEER) have some differences with those from Ecofys. The total RES-electricity support expenditure (M Euros) is 19.106 billion of Euros.
- The European funding for the period 2007-2009, funds spent on renewable energy amounted to roughly €9.8 bn, (€3.26 bn/a), mostly in the form of loans from the European Investment Bank. The European Regional Development Funds (ERDF) and the Cohesion Fund (CF) are the most important funds on renewable energy. The expenditure planned by these funds on renewable energy for the 2007-2013 period amounts 4,760 M€. This represents a total of 680 M€ per year.
- Today's critical environmental challenges and prolonged global recession have resulted in calls for a new "green" economy that could simultaneously promote sustainability, generate economic growth and create jobs. A race is on among countries and localities to become the leader in green technology.
- Some observers question whether renewables will continue growing in Europe given the ongoing financial issues and a number of governments reducing renewable incentives. Some experts' conclusions raised the idea that a period of low government spending could favour continued growth of renewables. With limits on spending, governments are reluctant to support big-ticket capital investments in generation whether by government utilities or the private sector. This works against investments in nuclear, coal with carbon capture and even gas units.
- However, it is necessary to take into account that some 80% of the total energy subsidies in the EU-15 are paid to fossil fuels and nuclear energy according to the European Environment Agency, while just 19% goes to renewables.
- The NER300 is a European programme to finance - provide 50% of relevant costs- demonstration projects for renewable energies in the climate change policy framework (established by the EU Emissions Trading Directive). It covers 300 million

allowances from the new entrants reserve of the third phase of the EU Emissions Trading System for the co-financing of innovative renewable energy technologies -as well as commercial demonstration projects of environmentally safe carbon capture and geological storage (CCS) - in the territory of the EU. The allowances will be sold on the carbon market and the money raised -which could be 4.5 bn EUR if each allowance is sold for 15 EUR- will be made available to projects as they operate. The NER 300 is a useful tool, but it is not and cannot be able to replace stable framework conditions and markets adapted to the needs of a renewable energies based energy system.

- Financial new investment in renewable energy was significantly lower in 2010 in both Europe and North America, although this setback was more than out-weighed by growing investment in China and other emerging economies, and in small-scale photovoltaic (PV) projects in the developed world.
- Particularly in Europe, the growth of financial new investment in 2009-2010 was -22%, whilst compounded annual growth rate during 2004-2010 was 25%. In 2011, the biggest reductions in terms of absolute dollars came in US wind and European solar.
- The Japanese earthquake and the ensuing crisis at the reactors at Fukushima initially led to a sharp rise in the share prices of renewable energy companies. But it could be that gas-fired generation will be the prime, short term beneficiary of nuclear's problems, not renewables.
- In 2010 and in the beginning of 2011, a number of countries adapted photovoltaic feed in tariff schemes, with the Czech Republic, Spain, France, Italy, UK and Germany revising policies and tariff rates given unexpected rapid growth that resulted in escalating policy cost.
- The EU had already reached its first interim target for 2011/2012 (10.7) in 2010[16]; the RES in consumption was 12.5% and the RES in transport was 4.7% in the same year. All the Member states have reached or rose above their renewable energy interim targets for 2011/2012, except Ireland, Cyprus, Latvia, Luxembourg, Malta, Netherlands and United Kingdom.
- By 2020, the EU member states will collectively exceed the binding target of 20%; according to the National Renewable Energy Action Plans (NREAPs) around 20.7%. Sectorally, the share of renewable energies in electricity is predicted to increase to 34-34.3% with the highest contributions of wind energy, hydroelectric and biomass. Renewable heating and cooling is planned to reach 21.4-22.2% with biomass mainly. And the share of renewable energies in transport is forecast to be 11.27-11.7% mostly from biodiesel.
- However, there are more pessimistic experts[17] that expect that the majority of EU countries will fail to trigger the required investments in new RES technologies needed for the 2020 RES target fulfilment. According to these experts, the renewable energy share would be 14.8% (instead of 20%) in the business as usual scenario. If non-economic barriers are mitigated, with yearly expenditures of 82bn Euros (only 4bn more the in BAU scenario) the gap will be closed.
- With regard to the European debate about the renewable energy financial support post-2020. A majority considered that support should be available for selected technologies whereas few pepole favoured phasing out all support for renewables post-2020. Operative support could be provided for those relatively close to the

[16] European Commission (2012). Communication "Renewable Energy: a major player in the European energy market".
[17] Ragwitz et al, 2011. "Shaping an effective and efficient European renewable energy market". Fraunhofer Institute for Systems and Innovation Research (ISI), coordinator. "RE-shaping" study

market whereas at the very initial stage of development R&D support might be more appropriate.

- As for the conditions under which support for renewables continued to be justified, the absence of full internalisation of external costs, including through a robust carbon price, as well as removal of all subsidies for conventional generation were most often mentioned.
- There is no consensus whether the level of support to renewable energies should remain under exclusive national control or in favour of EU-level benchmarks. more than two thirds of public authorities responded that support should remain under exclusive national control.
- In general there was wide support for making support schemes more market-oriented and the importance of exposing renewables to market price signals in order to reduce distortions

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Annex to Chapter 1. European policy framework

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Annex to Chapter 2. Renewable energy development

Renewable Energy Sector Turnover in EU-27, 2010 (in millions of euros)

	Total par pays *Country total*	Photovoltaïque *Photovoltaic*	Éolien *Wind power*	Biomasse solide *Solid biomass*	Biocarburants *Biofuels*	Biogaz *Biogas*	Solaire thermique *Solar thermal*	Pompes à chaleur géothermiques *Ground source heat pumps*	Petite hydraulique *Small hydropower*	Géothermie *Geothermal energy*
Germany	36 860	20 240	3 780	6 060	3 050	1 510	1 160	720	250	90
Italy	16 164	8 000	3 450	942	1 318	900	490	n.a.	464	600
France	12 602	4 695	2 989	1 176	2 110	227	577	280	400	148
Sweden	10 158	70	725	5 986	2 052	0	30	1 000	295	n.a.
Denmark	7 981	270	6 860	5	750	36	50	n.a.	5	<5
Spain	7 861	2 845	1 800	1 437	950	53	300	0	471	<5
United Kingdom	7 419	1 200	4 500	350	170	1 044	75	75	n.a.	<5
Austria	5 655	750	470	2 829	424	55	420	207	500	n.a.
Czech Republic	4 612	4 000	25	5	286	86	110	40	60	n.a.
Belgium	3 925	1 200	370	2 173	85	0	35	22	10	30
Netherlands	2 396	1 000	840	71	170	100	55	85	0	75
Poland	1 870	<1	550	565	500	36	100	75	28	15
Romania	1 661	5	500	1 057	38	<1	20	n.a.	14	26
Portugal	1 606	180	700	214	350	0	157	n.a.	n.a.	<5
Finland	1 291	5	780	106	214	10	<5	145	26	0
Greece	1 150	500	140	203	110	0	175	0	22	n.a.
Slovakia	731	400	0	67	173	7	10	5	45	25
Hungary	656	5	110	244	206	<1	10	20	5	55
Bulgaria	513	30	240	75	100	6	5	n.a.	33	25
Estonia	500	<1	55	400	10	<1	<5	23	5	0
Lithuania	388	<1	70	200	100	<1	<5	6	5	0
Latvia	354	<1	<5	287	50	<1	<5	n.a.	5	n.a.
Cyprus	321	80	100	101	10	5	25	0	0	0
Ireland	276	<1	200	5	30	0	25	5	5	<5
Slovenia	198	75	0	57	15	6	<5	20	15	<5
Luxembourg	43	8	<5	5	<5	5	<5	0	10	0
Malta	11	<1	0	0	<5	0	<5	0	0	0
Total	**127 203**	**45 564**	**29 264**	**24 621**	**13 281**	**4 084**	**3 864**	**2 728**	**2 673**	**1 119**

Source: Eurobsever 2011

Annex to Chapter 3. Renewable energy development

Renewable Energy employment in EU-27, 2010 (only direct jobs). Source: Eurobsever 2011

	Total par pays *Country total*	Biomasse solide *Solid biomass*	Photovoltaïque *Photovoltaic*	Éolien *Wind power*	Biocarburants *Biofuels*	Biogaz *Biogas*	Solaire thermique *Solar thermal*	Pompes à chaleur géothermiques *Ground source heat pumps*	Déchets* *Waste**	Petite hydraulique *Small hydropower*	Géothermie *Geothermal energy*
Germany	361 360	60 900	107 800	96 100	23 100	38000	13 100	12 000	6 660	2 400	1 300
France	174 735	60 000	58 100	20 600	15 200	965	8 070	3 800	3 700	2 500	1 800
Italy	108 150	7 000	45 000	28 600	9 900	2600	4 900	150	1 000	3 000	6 000
Spain	98 300	8 000	19 500	30 750	29 000	1350	6 000	0	1 500	1 600	600
Sweden	54 780	26 500	750	4 500	6 200	500	380	11 500	3 000	1 450	n.a.
Finland	48 620	35 000	100	6 400	3 200	300	<50	2 900	250	420	0
Austria	41 600	17 400	4 400	3 300	7 900	1500	4 700	1 100	150	1 100	50
Denmark	36 400	5 800	400	25 000	1 300	700	450	100	2 500	50	100
United Kingdom	31 700	2 000	5 000	9 200	5 300	6000	900	1 500	1 500	250	<50
Poland	28 450	7 500	<50	7 000	9 600	1000	1 250	1 500	<50	300	200
Belgium	22 670	2 700	6 200	3 000	9 400	0	420	450	250	50	200
Czech Republic	20 200	3 500	8 000	350	5 800	0	1 400	800	50	300	n.a.
Netherlands	19 180	250*	2 300	2 600	4 000	1880	1 420	1 700	4 480	<50	500
Portugal	17 425	3 700	3 500	4 450	3 000	0	1 875	100	300	400	100
Romania	16 800	13 500	<50	1 500	750	<50	250	100	n.a.	400	200
Greece	12 920	3 000	4 250	1 570	350	0	3 000	100	n.a.	550	100
Hungary	11 550	2 000	100	1 400	6 600	<50	150	400	50	<50	750
Latvia	9 300	5 500	<50	<50	3 500	<50	<50	100	<50	50	n.a.
Slovakia	7 030	800	1 000	0	4 500	<50	130	50	<50	300	150
Lithuania	5 850	3 000	<50	900	1 500	<50	<50	150	n.a.	<50	100
Bulgaria	5 470	1 100	350	3 000	300	<50	70	100	n.a.	300	200
Ireland	3 500	600	<50	2 000	350	0	300	100	<50	<50	n.a.
Slovenia	3 375	1 800	800	0	250	165	60	50	<50	100	100
Estonia	3 100	1 500	<50	350	<50	<50	<50	1 000	n.a.	<50	0
Cyprus	1 095	50	160	475	<50	<50	310	0	n.a.	0	0
Luxembourg	500	50*	<50	<50	<50	<50	<50	100	<50	<50	0
Malta	150	0	<50	0	<50	0	50	0	n.a.	0	0
Total	**1 114 210**	**273 150**	**268 110**	**253 145**	**151 200**	**52 810**	**49 485**	**39 850**	**25 690**	**15 970**	**12 550**

Annex to Chapter 5. Funding for innovative renewable energy sources

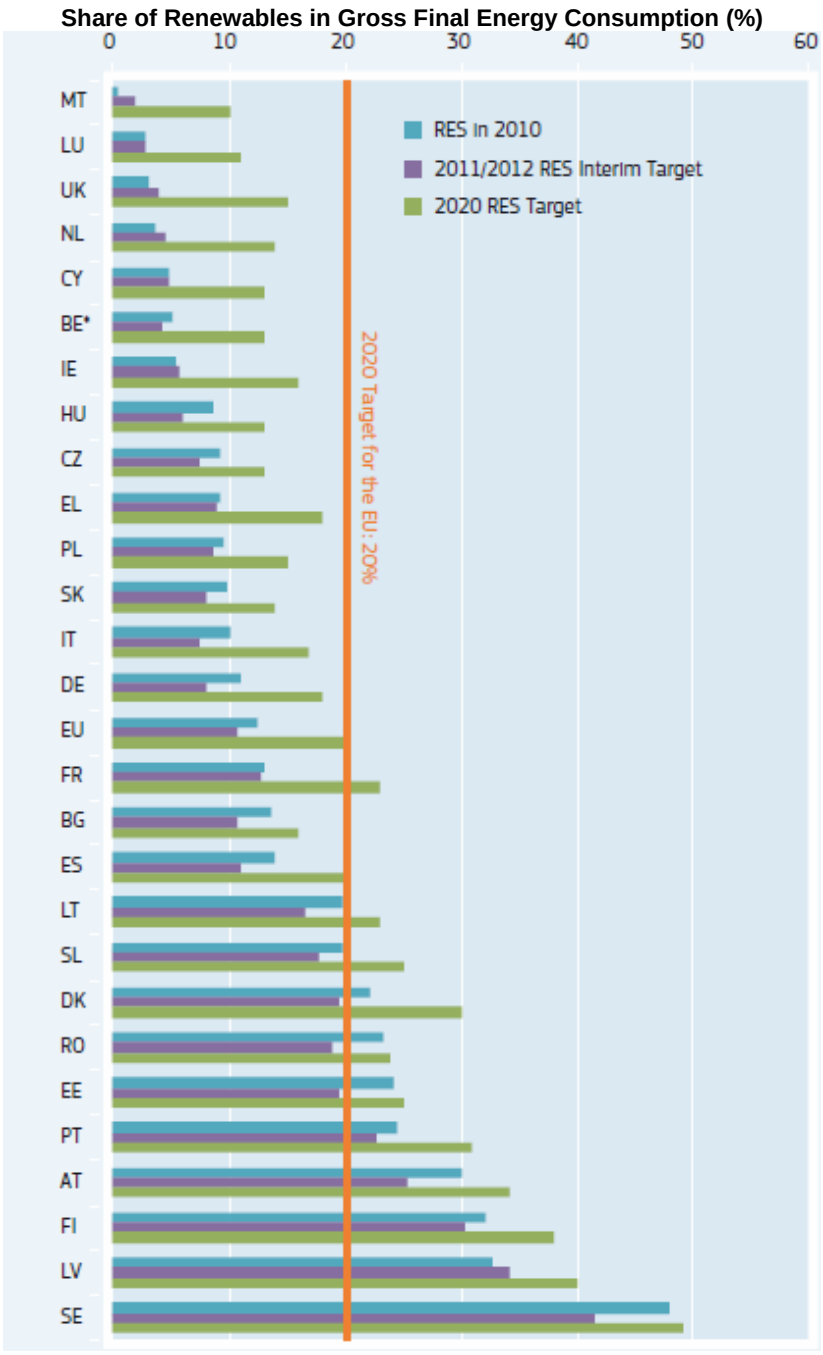
Renewable energy funding programmes in EU

Fund(s) of	Programme	Programme total budget	Budget allocated for RE in 2008	Budget allocated for RE in 2009	Main Financing instruments	Expected expanditure (until 2020)	Countries	RE Technologies	Types of projects funded
EBRD	**SEI** (Sustainable Energy Initiative)	SEI phase 1 results (2006-2008) : € 362 million signed for SEI 2 (Sustainable energy - RE and EE-credit line) € 227 million signed for SEI 4 (Renwable energy) => **€ 277 million signed in RE sector**	€ 141 million (SEI4)	€ 138 million (SEI4)	- Credit lines : loans through local banks - Long-term debt financing / Equity Investment / Senior Loans	SEI phase 2 (2009-2011) : RE financing > € 500 million	EBRD Countries	Wind, Hydro	RE installations investments/ Credit lines
EBRD	**TCFP** (Technical Cooperation Funds Programme)	NA	€ 12 million	-	Grant co-financing and TC grants	-	EBRD Countries	RE&EE	Pre-development phase
EC	**IEE > ELENA** (European Local Energy Assistance)	2007 - 2013 : € 150 million	0	€ 15 million	Grant support	€ 30 million / year or more	EU Member States, Norway, Iceland, Liechtenstein and Croatia.	RE / EE / Urban Transport	Technical Assistance - Project development
EC	**IEE** (Intelligent Energy Europe)	2007-2013 : € 730 million (total EIE Budget) of which € 78 million in 2008 and € 96 million in 2009	€ 19 million	NA	Grant support	Not yet decided	EU Member States, Norway, Iceland, Liechtenstein and Croatia.	RE-E / RE - H&C / RE - CHP / Biofuels	Capacity building
EC	**FP7** (Seventh Framework Programme)	Total budget for the period of 2007-13: € 50 billion, **including € 1 billion for Renewable Energy**	€ 150 million	€ 150 million	Grant support	€ 150 million / year until 2013.	EU Members States	RE & EE	R&D and Demonstration
EC	**EU Recovery Plan**	Total budget for 2009-2010 : € 5 bn, including **Offshore wind energy (€565 million)**	0	€ 565 million	Grant support	€ 565 million in 2009-2010	EU Members States	RE	RE installations investments
EC	**EIP > GIF** (High Growth and Innovative SME Facility)	2007 - 2013 : € 550 million. The part of this budget which is allocated to RE is not available.	€ 79 million	€ 79 million	Venture Capital	€ 79 million per year on average until 2013	EU Member States, Norway, Iceland, Liechtenstein and candidate countries for enlargement.	NA	Early and expansion stage companies
EC	**EIP > SMEG** (SME Guarantee Facility)	2007 - 2013 : € 506 million. The part of this budget which is allocated to RE is not available.	€ 72 million	€ 72 million	Guarantees	€ 72 million per year on average until 2013	EU Member States, Norway, Iceland, Liechtenstein and candidate countries for enlargement.	NA	Early and expansion stage companies
EC	**ERDF** (European Regional Development Fund) and **CF** (Cohesion Fund)	2007-2013 : € 4,760 million.	€ 680 million	€ 680 million	NA	€ 680 million per year on average until 2013	EU Member States.	Biomass, hydroelectric, geothermal, solar and wind	RE installations investments
EIB	NA	NA	NA	€ 2,800 million	Loan and framework loans	NA	Mainly EU Member States	Mainly wind, hydroelectric and solar PV	RE installations investments

Source: Ecofys, 2011. Note: The budget for the ERDF also includes Cohesion funds.

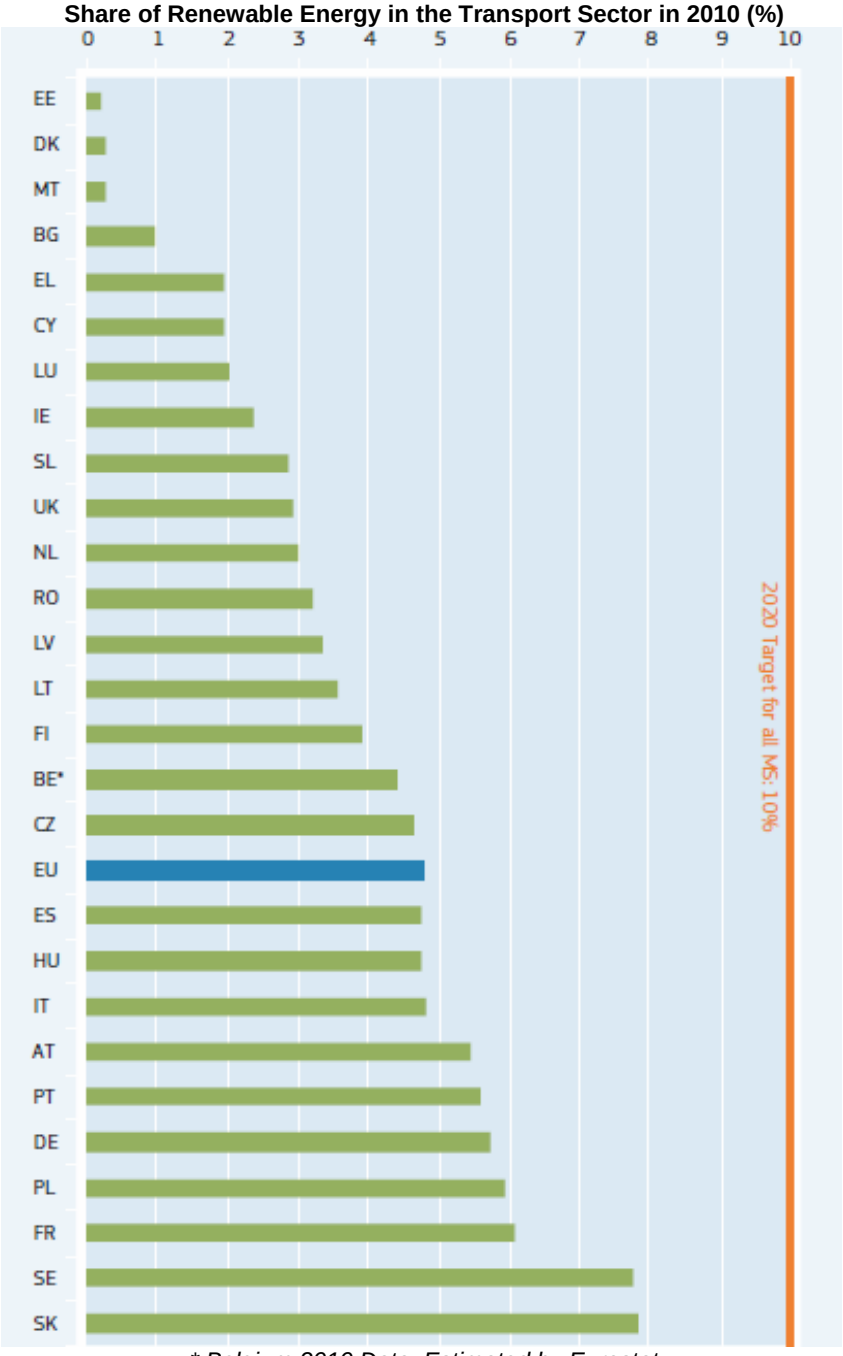
Annex to Chapter 8. Main expectations of RE sector by 2020

Progress towards 2020 targets in RE in 2010



** Belgium 2010 Data: Estimated by Eurostat*
Source: Eurostat June 2012 and Directive 2009/28/EC for Targets

Share of Renewable Energy in the Transport Sector in 2010 (%)

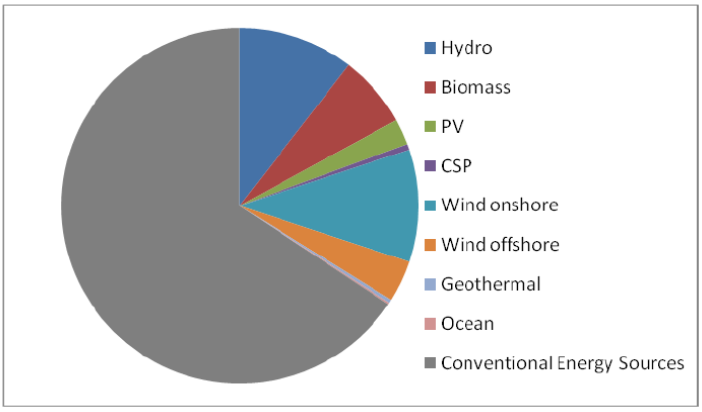


** Belgium 2010 Data: Estimated by Eurostat*

Source: Eurostat June 2012 and Directive 2009/28/EC for Targets

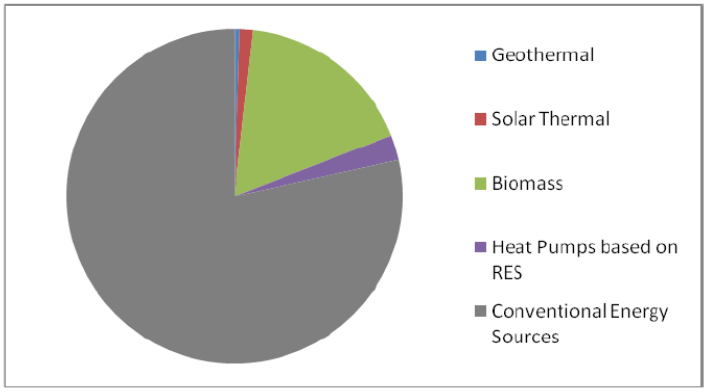
Projections according to the National Renewable Energy Action Plans

RENEWABLE ENERGY SOURCES IN THE ELECTRICITY MIX IN 2020



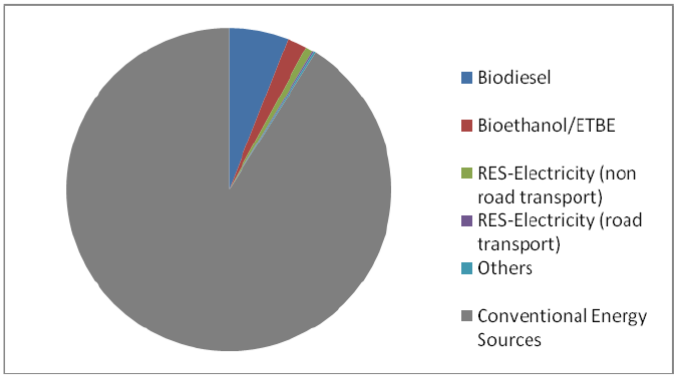
Source: EREC based on the NREAPs (Table 1 & 10b)

RENEWABLE ENERGY SOURCES IN THE HEATING AND COOLING MIX IN 2020



Source: EREC based on the NREAPs (Table 1& 11)

RENEWABLE ENERGY SOURCES IN THE TRANSPORT MIX IN 2020



Source: EREC based on the NREAPs (Table 1 & 12)

EREC's projections by 2020

	National Binding Targets established by the 2009/28/EC Directive	Renewable Energy Share in Final Energy Consumption forecast in the NREAPs (based on Tables 1 & 4a)
AT	34%	34.2%
BE	13%	13%
BG	16%	18.8%
CY	13%	13%
CZ	13%	13.5%
DK	30%	30.5%
DE	18%	19.6%
EE	25%	25%
EL	18%	20.2%
ES	20%	22.7%
FI	38%	38%
FR	23%	23%
HU	13%	14.7%
IE	16%	16%
IT	17%	16.2%
LT	23%	24.2%
LU	11%	8.8%
LV	40%	40%
MT	10%	10.2%
NL	14%	14.5%
PL	15%	15.5%
PT	31%	31%
RO	24%	24%
SL	25%	25.2%
SK	14%	15.3%
SE	49%	50.2%
UK	15%	15%
Total EU	**20%**	**20.7%**

Source: EREC and NREAPs.

EU 27 Total and sectoral RES share from 2005 to 2020

Share in the sector %	2005	2010	2011	2012	2013	2014
Heating and cooling	9.84	12.47	13.11	13.73	14.41	15.13
Electricity	15.18	19.43	20.67	21.96	23.33	24.72
Transport (as in Article 3(4)a (3) calculated)	1.42	5.07	5.57	6.06	6.27	6.84
Total RES Share	8.5	11.6	12.3	13.0	13.7	14.5

Share in the sector %	2015	2016	2017	2018	2019	2020
Heating and cooling	15.93	16.86	17.87	18.92	20.18	21.43
Electricity	26.00	27.41	28.98	30.56	32.13	33.91
Transport (as in Article 3(4)a (3) calculated)	7.38	7.98	8.90	9.69	10.40	11.69
Total RES Share	15.3	16.2	17.2	18.3	19.4	20.7

Source: JRC, 2011.

III. NATIONAL CASES

1. Germany
2. Italy
3. United Kingdom
4. Spain
5. Sweden
6. Bulgaria

IV. GENERAL CONCLUSIONS AND KEY MESSAGES

Employment

In Germany a substantial renewable energy industry emerged in the past years. Currently more than 380,000 employees are working in the renewables sector (direct and indirect). Furthermore the sector is expected to continue its positive development.

In Italy, the creation of green jobs linked to the renewables sector in a period of low economic growth and recession (about 120,000 in 2011 - MED data).

The renewable industry in United Kingdom supported 110,000 jobs (direct and indirect jobs).

In Spain, there are 148,394 workers in the RES sector, 88,209 of them are direct jobs.

In Bulgaria, there are 5,470 workers in the RES sector (direct and indirect). The employment in RES in Bulgaria is still limited and the employed are not unionised.

In Sweden, according to Eurobserver report (2011), there are 54,780 jobs (direct and indirect). In general the renewable energy workers have rather good level of affiliation and the quality of jobs is sufficient so as there have not been collective bargains.

Target 2020: current situation and perspectives

Germany

Renewables now make up 12.5% of total final energy consumption (BMU 2012a).

Renewables represents 20% on TPES and 12.5% of total final energy consumption in 2011.

Therefore it defined a target to increase the share of renewable energies in the total electricity supply to at least 12.5% by the year 2010 and to at least 20% by the year 2020 in line with the EU directive 2001/77/EC.

The German 2020-target is to reach 10% of renewables in the transport sector. This quota does not have to be entirely covered by biofuels. The growing electric mobility sector also supports the share of renewables in the transport sector.

Italy

In particular, the consumption of electricity from RES represents the greatest share in comparison with the other sectors, reaching 20.1% of final energy consumption in 2010 (26.4 by 2020). The heat and transport sectors are those in which the consumption of renewable energy is lower, reaching respectively in 2010: 9.5% for energy from heat (17.1% by 2020) and 4.8% for transport (10.1% by 2020). In 2010 the overall share of RES in final energy consumption was 10.1%. By 2020 the overall share of RES in final energy consumption will be 17%.

United Kingdom

In 2011, 3.8% of final energy consumption was from renewable sources, renewables generated 9.4% of the total electricity and around 14% of renewable sources were used to produce heat in the United Kingdom. With regard to the transport sector, biodiesel accounted for 3.6% of diesel, and bioethanol 3.3% of motor spirit.

There is uncertainty about the prospects of the UK meeting its 2020 targets. In its roadmap document the government also states that despite uncertainty about the contribution from individual technologies, the UK can deliver 234 TWh of renewable energy overall in 2020 – equivalent to the necessary 15% of projected energy consumption.

Spain

In 2010, 20.8% share of renewable energy at final energy consumption.

Renewable energy share in "electricity" is expected to be 38.1% by 2020. This was a realistic target at electricity sector as support schemes were working well at this sector.

There are no official estimates on job losses since the beginning of the crisis, however employers' organizations estimate some 20,000 jobs lost out of 150,000 jobs in 2010 and this figure is expected to increase in the next future due to the moratorium on premiums in the electricity sector that implies shutting down new renewable power facilities at least until 2015.

Regarding the goals for 2020 assumed by Spain, the administration considers that they can be met, although the rest of stakeholders assure that they are hardly achievable unless the moratorium on the electricity sector is lifted. To this regard the European Commission warned in one of its communications that Spain will not be able to comply with its 2020 goals if the moratorium remains in force.

Bulgaria

The goal of Bulgaria's National Programme on Renewable Energy Sources (2005 - 2015) is to significantly increase the share of non-hydroelectric RES in the energy mix in order to attain 16 % in 2020 (the mandatory targets set by the Directive on the Promotion of the use of energy from renewable sources 16 % share of RES on the final consumption of energy in 2020 and at least 10% share of renewable energy in final consumption of energy in transport by 2020).

In general the renewable energy targets for the country seems to be realistic, both concerning 2010 and 2020 targets, according to the interviewed representative of MIET (see more in part 6). The Energy Strategy of Republic of Bulgaria (from 2011[18]) examines two scenarios for the progress towards meeting the RE targets. The first scenario is called Basic, according to it the 16% share of RES in the FEC will not be fulfilled and this share will reach only 13 % in 2020. The second scenario, called the Goal oriented, implies the reach of the target with more than 18% share in 2020.

The share of RES in the gross consumption is complying with the EU targets – for example in 2010 the RES contributed to 15% of the electricity generation exceeding largely the 10.6% EU target.

[18] http://www.mi.government.bg/files/useruploads/files/epsp/22_energy_strategy2020_.pdf

Sweden

Sweden's target for the share of renewable energy in the year 2020 is 49 % according to EU's Directive on the promotion of the use of energy from renewable sources 2009/28/EC. Furthermore, Sweden has a national target for the share of renewable energy in the year 2020 of 50 %.

Speaking about the future of the renewable energy sector by 2020 in Sweden, the level of ambition of the 49% renewable energy target is relatively low splitting into 62.9% RES-Energy, 62.2% RES-Heating&Cooling, and 13.8% RES-Transport. The Swedish Energy Agency has made a prediction based on existing incentives and arrived at 50.2% RES by 2020, which is not a goal that needs any kind of effort to be met. On the contrary, the 2020 target is even below the trend of RES since 1996.

In fact, the share of RES was already 48% in 2009, according to the Swedish Energy Agency. The Swedish Energy Agency's forecast for 2020, has calculated an increase to 50.2%, with the current support policies, but no strengthened support schemes. They also calculate with a 15.5% higher energy use than 2009, which is a very unlikely development, considering the EU targets of energy use reductions by 2020.

Support mechanism for renewable energies

Electricity:

Germany: Feed-in tariff (EEG feed-in tariff), Loan (KfW Renewable Energy Programme – Standard), Premium tariff (a market premium for direct selling and a flexibility premium

Italy: Feed-in tariff, Net-Metering, Premium tariff, Quota system, Tax regulation mechanisms (Reduction in value-added tax and in real estate tax) and tenders.

United Kingdom: Feed-in tariff, Quota system, Tax regulation mechanism (Climate Change Levy).

Bulgaria: Feed-in tariff, Loan (Bulgarian Energy Efficiency and Renewable Energy Credit Line - BEERECL), Subsidy (Operation Programme Competitiveness and other EU structural funds).

Spain: Feed-in tariff, Premium tariff, Tax regulation mechanisms (Business Tax Reduction).

Sweden: Quota system in terms of quota obligations and a certificate trading system, Subsidy for the photovoltaic installations, Tax reductions for wind energy (of real estate and energy taxes).

Heating:

Germany: Loan (KfW Low-interest loan) KfW provides low-interest loans with grant payback support for the development and expansion of heat installations/plants. Subsidy (Investment Support).

Italy: A tax regulation system is currently in place.

UK: Price-based mechanisms (RHI). The Renewable Heat Incentive (RHI) is the main instrument to support RES-H non-domestic installations with a fixed amount per kWh produced. It is likely to be extended to domestic installations. Subsidy (Renewable Heat Premium Payment) (RHPP) for domestic installations, which provides a once-only subsidy to households that apply for the scheme for installing RES-H generators.

Spain: Tax regulation mechanism. At a national level, a tax reduction mechanism is in place for solar thermal installation, subject to specific conditions. The Spanish National Renewable Action Plan indicated also that a price-based mechanism for RES-H is to be established (”ICAREN”), however up to now no further information is available.

Sweden: Tax regulation mechanism: Tax reductions for households works and energy exemption.

Bulgaria: Loan (Bulgarian Energy Efficiency and Renewable Energy Credit Line, Bulgarian Energy Efficiency Fund and Residential Energy Efficiency Credit Line), Subsidy (The Operational Programme Competitiveness), Tax incentives for buildings owners.

Transport

In the transport sector, the two unique instruments used to promote renewable energy sources are the biofuel quota and/or the tax exemption for biofuels (Italy and UK used only the quota obligation, Sweden applied tax reduction mechanism and the rest of the analyzed countries used both mechanism).

Effects during economic crisis

Germany

In Germany, renewable energy technologies continued to growth even during the economic crisis. Renewables increased its share in energy supply and the employment was able to record further growth. Both domestic demand and foreign markets contributed to this stable development in the German industry.

The decision about nuclear phase-out by the end of 2022 secured the situation of the German renewables sector.

Currently the main support scheme of renewable electricity (EEG) is under revision. The amendment 2009 of EEG decreased considerably the feed-in tariffs for solar photovoltaic (PV) for all capacity sizes, but these corrections were taken because market prices for solar PV constructions dropped significantly, following the International Energy Agency recommendations. These changes had not direct connection to the financial crisis.

The costs of the German feed-in tariffs are mainly covered by the electricity bills of household consumers. In the future a new kind of conflict around redistribution might emerge. The main decision points will be the amount of money that the society is prepared to pay for the support of RE and the alleviation of the energy intensive industry.

Italy:

In Italy, the main support instruments for renewable energies appeared between 2008 and 2010 and because of that the creation of jobs continued even in the low economic growth period. However, the scenario of crisis and recession was not irrelevant.

The rapid increase of this sector, combined with the reduction in technology costs which is leading towards a grid parity scenario in PV, triggered in 2010 a debate on the abandoning of the system of incentives established and how to achieve this.

Afterwards, in 2011, there was a redefinition of support schemes with the aim of reducing financial spending on incentives and provide more support to the heat sector. In 2012 the new Energy strategy (approved by the Ministerial Decree 06/07/2012) set

the need to balance the mix of sources, times and costs of upgrading the network and a redefinition of the new target of electricity from renewable sources by 2020 -which may be equal to 32-35% of total electricity consumption.

So far this moment, the social debate is focused on the issue of whether or not to place a ceiling on the incentives and the number of installations to incentivise. The question about shifting the system of economic incentives from users towards general taxation has been suspended.

United Kingdom

The renewable sector in the UK has clearly progressed in recent years albeit from a very low base.At a time of recession the sector is one of growth.

The key challenge facing the renewable sector in the United Kingdom is the current uncertainty it faces regarding future funding.

The new Electricity Market Reform (EMR) - that will replace the Renewables Obligation mechanism- in its current form will not attract investors and will also enforce a spending cap to protect consumers' energy bills.

The lack of government support for renewables is deterring crucial investment in the sector to ensuring the future viability of many technologies. Although offshore wind subsidies are now set until 2017, those for onshore wind are to go to another consultation. On the other hand, the sudden announcement to cut the subsidy rate for solar installations caused outrage in the industry. As a result the number of homes installing solar has reduced drastically since the start of August even though the solar industry maintains that installing panels still makes good financial sense.

The lack of certainty surrounding the future funding in support schemes (Renewable Obligation and the Feed in Tariff) and the cap on funds keep investor confidence low and lack of investment now will inevitably have long-term repercussions and may well make it impossible to meet the 2020 targets.

The new chair of the Committee on Climate Change has warned that the government is in danger of breaching its own commitments on climate change by supporting the new gas-fired power stations.

Spain

Cutbacks in support mechanisms to renewable started just before the outbreak financial crisis, due largely to deficient planning that that did not take into account cost reductions in some technologies.

The financial and economic turmoil fully affected the Spanish economy in 2008 and the energy sector was affected in the initial years of the crisis due to its high reaction to variations in demands and to serious imbalance in the electric tariff system.

Cutback in support schemes started in 2010 and affected primarily photovoltaic energy although it quickly extended to the all the other technologies.

In 2012 it was adopted a moratorium to FIT in the electricity sector for all renewable technologies. This measure resulted in a major blow for the sector. Some planned subsidies for the thermal sector were also restricted and eventually were never implemented.

Bulgaria

Due to the previous attractive regulatory framework and lucrative feed-in tariffs a flood of investments was seen in 2008. The government response to unexpected interest from investors was a new rather restrictive Renewable Energy Act passed in April

2011. The new RES Act now abolishes the priority access to the grid for RES producers completely. The law places renewable energy behind all other kinds of energy. The law envisages to stop the application of the support mechanism after the indicative target for Bulgaria is achieved. This measure is in direct violation of EU directives. Another serious barrier is the fact that RES investors will find out the price at which they will be selling their energy only after the construction of their power generating facilities is completed

In 2012 the feed-in tariff (FIT) rates for the obligatory purchase of solar generated electricity have been cut by over 50 percent in Bulgaria. The cuts concerned also the wind sector (with 22 percent).

In this way, during 2011 and 2012 the new changes of the RES legislation and regulation led to a significant decrease of the support for RES. These developments, some of them retroactive, provoked a strong protest from investors complaining about changing rules, lack of transparency and problems for their investment. The newest legal changes seem to contribute to slow down the investors' interest in the sector but it is too early for definitive conclusions.

The Bulgarian regulator also raised prices for consumers, increasing them by 13 percent from the 1st of July 2012. It said that a large part of the increase was because of the growing proportion of more expensive green energy.

Sweden

The share of renewable energy in Sweden is the largest in the EU and the projections foresee to fulfil these targets even earlier than 2020. This has plausible been due to supporting politics in the field of renewable energy.

In recent years the number of mechanism has been increased, largely to fulfil the targets in renewable energy field. The indirect reason has also been supporting green companies and stimulating the export. This has also seen as one of the methods getting out from the crisis.

Some instruments or measures have ceased during couple of recent years since the Action Plan, but these have mostly been due to restructuring, not restricted resources due to economic decrease.

Final remarks

- The six countries analyzed in this report have support schemes to promote renewable energies. Support schemes are generally stronger for the electricity sector and less effective for renewable heating projects. In the electricity sector feed in tariff (FiT) is the most common instrument. FiT are expenditures that in most of the cases (all countries studied) are paid by final consumers.
- Although there is a perceived reduction of investment in renewables in Europe -compared with previous years and with other regions-, the sector has generally grown during the crisis. This factor reflects on the growing share of renewables in the energy supply, on new installed power and even on job creation. In this perspective renewables might have endured the economic crisis in better circumstances than other sectors. However, there are some exceptions like the case of Spain, where thousands of jobs were lost.
- The clearest effect of the crisis on the renewable energy sector is the cutback of retributions to solar photovoltaic energy. This can be partly explained by the reduction of costs for this technology. Wind energy was also affected by significant cutbacks (e.g. in UK and Spain), but the consequences of such reductions could be less devastating since wind energy has a more mature technology than the solar energy sector. European photovoltaic industry is also suffering because of Chinese competence with less expensive solar panels.
- Support schemes to renewables have changed in most countries although not always as a consequence of the economic crisis. Reasons for these changes include: the global reduction of costs for renewable technologies, the will to improve the efficiency of economic incentives, the determination to avoid the excessive profits for investors -as it occurs in Bulgaria or Spain- and the competence and tensions with traditional energy sources to obtain the highest energy mix share.
- It is important to note that renewables are part of a highly competitive market in which traditional energies (fossil or nuclear) are important players. Any decision on nuclear energy (like the early closure of nuclear plants in Germany, the referendum on nuclear energy in Italy) will have a clear impact on the development of renewable energies. The future perspective of gas plants in the UK and Spain will also have a significant effect on the future growth of renewables.
- One of the most common government arguments to modify and reduce economic incentives to renewable energies is their impact on the price of electricity. However, there is a open debate about this controversial issue.
- The primary threat to renewables comes from regulatory uncertainty, a situation that has especially affected the UK, Italy and Spain. A stable policy and regulatory framework is essential to assure long term investments. To this respect the post-2020 EU energy strategy turned out too weak to overcome national difficulties.
- One of the main obstacles found by researchers of this project is the lack of information, difficult access to data and the wide variety of statistics, especially regarding investments and national/regional support mechanisms expenditures. In many cases data on public and private investment are not disaggregated which complicated the drawing of any conclusions on public policies/ expenditures to support renewables.
- Even though the renewable energy sector had a significant growth in terms of energy supply, business volume and jobs during the last decade, renewables remain an emerging activity that requires government support to reach its full development, especially in the case of less developed technologies.

- Further investment is required in infrastructure, smart grids and storage for the sector of renewables to continue growing (as it is expressed in the cases of Italy and Germany). In Spain, regulation on net-metering becomes essential for the growth of renewables, even in the context of the moratorium on such facilities.
- Governments are convinced of their capability to meet national renewable energy goals for 2020; however, recent regulatory changes might have a negative effect on the achievement of these objectives. To this respect, of all the countries analyzed in this report, Bulgaria has implemented the toughest regulatory restrictions on renewables. Among the measures implemented was the elimination of priority access for renewables in a direct violation of the EU Directive on renewable energy.
- There is a consensus among stakeholders for the need to continue expanding the sector of renewable energies. Worker representatives and trade union organizations regard the development of the renewable sector as an economic improvement in the context of the current crisis and as a source of jobs. There are however differences in union position across the EU, between countries where the renewable sector is an emerging activity with worse working conditions than traditional energy producers (e.g. Bulgaria), and those countries that have achieved certain level of development and job quality (e.g. Sweden).
- The debate on the future of public support to renewables is very active at the moment. New changes in the support schemes were announced in 2012 in the UK and Spain which still need to be defined and developed. It becomes essential to analyze the social and economic impact of new regulatory changes, particularly their effect on jobs. These circumstances made even more complicated the position of central government officials in the interviews carried out for this study.