GREEN - BRIDGES FROM GREY TO GREENING JOBS
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Report of prospective and trends in the renewable energy sector

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INTRODUCTION

GREEN - BRIDGES FROM GREY TO GREENING JOBS Project is financed by the European Commission within the framework of the Lifelong Learning Programme, in order to support the realization of a European area for lifelong learning and to enhance the attractiveness of vocational education and training and mobility for employers and individuals. It will be developed during 2011-2013 in a coordinated manner in Spain, Finland, Lithuania, France and Bulgaria.

In order to that, GREEN project is aimed at developing and testing a European device, in electronic format, to favor the professional mobility and recognition of the knowledge, aptitudes and competences acquired by employees of renewable energies, in different countries and in different contexts (formal and non formal).

The present report is aimed at identifying and evaluating the incidence of different trends in the renewable energies sector. This identification of trends is a step which is previous to the determination of the most sensitive key processes in this field to the changes and the identification of key competences bond to these processes.

In this report the main (technological, organisational…) trends identified in the different countries taking part in GREEN project will be presented. Taking into account the transnational value of the project, we have made an effort to synthesise, identifying and selecting the trends the different countries have considered as the most important and influencing in the medium term for the renewable energies sector.

OBJECTIVE and METHODOLOGY

Objective

The results got in this report constitute the element to build the rest of the project and on which the other products developed in it will be consolidated. It is aimed at being a starting point to, first, identify the 3 Key job categories in Renewable Energies and describe them in terms of knowledge, skills, competences and, second, to develop and experience an Interactive on line tool to recognize and transfer these job categories among European countries.

As a first step, the objective of the present report is to identify and select the most important and influencing trends on the renewable energies will undergo in the short and medium term in Europe.

In order to that, the following steps were followed:

- analyse the general scope of the renewable energies and measure the most important and influencing trends that will occur in the renewable energies sector in the short term at national level.

- select the different trends that at transnational level appear as the most important and influencing in the short term in the renewable energies field.

Methodology

In order to determine the main trends that are going to influence the renewable energies at transnational level, the coordinating organisation elaborates an intervention methodology, agreed in the first transnational meeting and adopted by international agreement. This way, we decided for a double analysis of information sources:

- Documental analysis
- Questionnaires with key informants

Documental analysis

The documental analysis is aimed at knowing the technological, economical and organisational trends mentioned in national researches and surveys as the most important and influencing in the renewable energies in each country taking part in the project.

The research starts from the analysis of publications and researches focused on the changes the renewable energies is facing and is going to face in the different countries. It is agreed that each partner will summarise (approximately 5 pages) the analysis and main trends in his/her country.

The criteria followed to select the documental sources, agreed in the first transnational meeting, state that these sources should be legitimate in the renewable energies sector and have national recognition and prestige, allowing each partner country to choose its sources. The documental sources used are identified further, at the end of each national analysis. (annex)

Once the results got during the research process have been analysed, first, certain common trend areas have been identified for the countries taking part, and second, we have proceeded to group, according to these areas, the different technological, economical and organisational identified trends with transnational value that can influence the renewable energies in the short - medium term.

The result is a synthesis of the main trends classified in 5 great trend areas:

- Trade globalization
- Economic changes
- Legislative and regulatory changes
- Organizational changes
- Changes in process and technologies
- HH.RR. Changes

This group of trends is constituted as a basic tool to carry out the field analysis, that is, the interviews with key informants.

Questionnaires with key informants

The field work has three objectives:

- First, to evaluate, among the trends that have been identified in the documental sources, those the people related to the renewable energies consider as the most **important** (assessing from 1 = not important at all to 4 = very important).
- Second, to know which of these trends / changes **influence** or **affect** the most the renewable energies (1 = nothing at all; 4 = a lot).

- Third, to evaluate the time these trends / changes **will influence** the renewable energies (1= very short time; 4 = very long term).

The criteria for the selection of the experts were agreed in the first transnational meeting. The partners agreed to carry out the fieldwork with a sample of experts (3 per country min.) characterised by: enterprise associations, cluster of environmental industries, companies related to green jobs: HHRR, responsible..., companies related to renewable energies, organisations competent on qualification, public institutions, chambers of commerce, training centres and certification organisations, ...

The results got in the fieldwork, both on the trends and their meaning, and the estimations carried out about them by the key informants at national level, are put into a table to gather the conclusions and put in order of priority the trends at transnational level. In the following headline ("Results"), the average values got by the trends in the different countries where the fieldwork has been carried out are listed, as well as their average at transnational level by order of:

- IMPORTANCE
- INFLUENCE
- TERM

RESULTS

	IMPORTANCE						INFLUENCE						WHEN					
	ES	BG	LT	FI	FR	AVERAGE	ES	BG	LT	FI	FR	AVERAGE	ES	BG	LT	FI	FR	AVERAGE
TRADE GLOBALIZATION																		
Globalization of the production	3,3	3	3,3	2	2,5	2,8	3,3	2,8	2,7	2	3	2,8	XX	X			X	4
E.U. extension	1,3	3	2,3	2	2	2,1	1,7	3	2	2	2,5	2,2	X					1
Delocalizing	2,3	2,5	2,3	2	2,5	2,3	2,3	2,8	2	2	2,5	2,3	X				X	2
New trade opening	3,3	3	3	2	3	2,9	3,3	2,3	3,7	2	3	2,9	X		X			2
Competence globalization: entry of new competitors	3,3	2,6	3,3	3	3	3,0	3,3	2,8	3,3	2	3	2,9	X				X	2
Participation in EU projects		3	3,7	2	2,5	2,2		3	3	2	3	2,2	X					1
EU group of interest		3,6	3	2	3	2,3		3,3	2,3	2	3	2,1	X					1
Dependence from the offer of industrial equipments	2,3	2,5	2,7	3	3	2,7	2,3	3	3	2	4	2,9	X		XX		XX	5
Commercial feasibility	2,7	2,8	4	3	3	3,1	2,7	2,5	3,3	2	3	2,7	XX		XX			4
Production subcontrating and decentralization	2,7	2	3,3	3	2,5	2,7	2,7	2,3	2,7	2	2	2,3	XX				X	3
ECONOMIC CHANGES																		
Costs in the construction and assembly	3,3	3,6	4	2	2	3,0	3,3	2,8	3,7	2	2,5	2,9	X	XX	XX		X	6
Increment of supplies cost	3,3	2,3	3,7	2	2	2,7	3,3	3	3,3	2	2	2,7	X	X	X			3
Increase rates for Renewable Energy resources	3,7	3,5	3,3	2	1,5	2,8	3,7	3,5	3,3	2	2,5	3,0	X	X			X	3
Access to funding, funding lines for investments	3,7	3,8	3,7	2	3	3,24	3,7	3,8	3,7	2	3	3,2	XXX	X	XX		X	7
Rates making the investment attractive	2,7	3,5	4	3	3	3,2	2,7	3,5	4	2	3	3,0	XX		XX		X	5
Non-refundable benefits and tax incentives	3	2,8	3,7	3	2,5	3,0	3	3	3,7	2	2,5	2,8	XX		X		X	4
Percentage of investment made by companies	2,3	2,5	2,7	3	1,5	2,4	2,3	2,8	2,7	2	3	2,6	X	X				2
LEGISLATIVE AND REGULATORY CHANGES																		
Suitable law framework and specific laws for RE	4	3,8	4	3	3,5	3,66	3,7	3,8	3,7	2	3,5	3,3	XX		XX		X	5
Homogenising the administrative procedures	3,3	3,5	2,7	3	3	3,1	3,3	3,3	2,3	2	3	2,8	X	X	XX		X	5
Quality systems introduction and implementation	3	3	2,7	3	2,5	2,8	2,7	2,8	2,3	2	3	2,6	X		XX		X	4
Institutional support	2	3,8	3,3	3	2,5	2,9	2	3,8	3,3	2	2,5	2,7		X	X			2
Environmental legislation	3,3	3,3	3,7	3	3	3,26	3,3	3,5	3,7	2,5	3	3,2	XX	X	XX		X	6
Safety, security and health at work	2	2,3	3	3	2	2,5	2	2,5	2,7	2	1,5	2,1	X		X			2

ORGANIZATIONAL CHANGES																		
More flexibility within the organization and production of the company	2,3	2,5	2,7	2	2,5	2,4	2,3	2,8	2,3	3	2,5	2,6	X		XX		X	4
Supply management: Logistics and stock management	2,3	2,3	3	2	2	2,3	2	2,3	2,7	3	2,5	2,5	X		XX			3
People management new methods	2,7	2,8	2,7	2	2,5	2,5	2,3	2,8	2,3	3	3	2,7	X		X		X	3
Quality management	3	2,8	3	2	3,5	2,9	3,3	3	3	3	3	3,1	X		XX		XX	5
Safety and security management	2,3	2	3,3	2	2,5	2,4	2	2,5	3	3	2,5	2,6	X		XX		X	4
CHANGES IN PROCESS AND TECHNOLOGIES																		
Introduction of new information and communication technologies	2,7	3,3	3,3	3	3,5	3,2	2,7	2,8	2,7	3	3	2,8	X		XX			3
Technological innovations in the production (technology and equipment)	3,3	3,5	4	3	2,5	3,26	3,3	3	3,7	3,5	2,5	3,2	XX	X	XXX		X	7
Processes computerization	2,7	3,3	3,3	3	2	2,9	2,7	2,8	3	3	2	2,7	X		XX			3
Processes automation	3	3,3	3,3	3	2,5	3,0	3	2,5	3	3	2,5	2,8	XX		XX			4
Computer design	2	2,3	2,7	2	3	2,4	2	2,3	2,3	3	3,5	2,6	X	X	XX		X	5
New materials and measures instruments	2,3	3,3	3,3	3	3	3,0	2,3	3	3	3	3	2,9	X		XX		X	4
Opportunities for technological diversification	2,7	3,3	3	3	2,5	2,9	2,7	2,8	2,7	3	2,5	2,7	X		X		X	3
Public participation in R&D&I for the development of technology	2,7	2,3	2	2	2,5	2,3	2,7	2,3	2	3	3	2,6	X		XX		X	4
HH.RR. CHANGES																		
Lack of qualified people in the sector	2,7	3,3	3,7	3	3	3,1	2,7	3,5	3,3	3	3,5	3,2	X	X	X	X	X	5
Job mobility	1,7	2	3	3	2,5	2,4	1,7	2,3	2,7	3	2,5	2,4	X		X	X	X	4
Demand of new technologic competences	2,7	3	3,7	3	4	3,28	2,3	3,3	3,3	3,5	3,5	3,2	X	X	X	X	X	5
Resources for R&D&I	2,7	2,8	4	2	3	2,9	3	3	3,7	3	3	3,1	XX	X	X	X	X	6
Flexibility in workers´profiles (transversal competences)	2,3	2,3	3	3	2,5	2,6	2,3	2,5	2,7	3	3,5	2,8	X	X	X	X	X	5
Specific training	2,7	3,5	3,7	3	3	3,2	2,7	3,5	3,3	3	3,5	3,2	X		X	X		3
Lifelong learning need (LLL)	2,7	3,5	3	2	3	2,8	2,7	3,8	2,7	3	4	3,2	X			X	XX	4

EXPLOITATION OF THE RESULTS

The aim of this exploitation of results is to select the most important and influencing trends for the renewable energies during the next years. In order to that, the used methodology has been the application of the criteria to select trends agreed in the Partnership. The selecting criteria used have been the following:

- To measure the IMPORTANCE:
  - ✓ FIRST CRITERION. The trends that the consulted key informants have considered as average => 3,2
  - ✓ SECOND CRITERION: The trends get punctuations > 3 in at least 4 countries.
- To measure the INFLUENCE:
  - ✓ FIRST CRITERION: The trends that the consulted key informants have considered as average => 3,2
  - ✓ SECOND CRITERION: The trends get punctuations > 3 in at least 4 countries.
- To measure the TERM:
  - ✓ FIRST CRITERION. Mín 5 consulted key informants give = 1 (short term)

It is worth mentioning the homogeneity of the results in the different countries, in general. Regarding the IMPORTANCE and INFLUENCE of the trends, there are not important differences in the evaluations of trends among the different countries.

As a conclusion, the trends considered as the most IMPORTANT and most INFLUENCING in the renewable energies (trends that are clearly identified from the others in all the countries, getting the highest averages) are:

- Suitable law framework and specific laws for RE
- Technological innovations in the production (technology and equipment)
- Environmental legislation
- Demand of new technologic competences
- Access to funding, funding lines for investments

ANNEX: NATIONAL REPORTS

Trends in the renewable energy sector in Spain

General overview

- ✓ In Spain, renewable energies (RE) have very high increase rates, except for the Mini-hydro.
- ✓ Different causes have helped the RE development, among which it is worth underlining first of all, the institutional support
- ✓ The present development model has also caused some negative consequences: the project funding, the dependence from the offer of industrial equipments and the limits of commercial feasibility.
- ✓ The domestic RE market is made of a great number of SMEs. Almost 80% of these companies are not bigger than 50 workers and is fragmented in different Autonomous Communities (mainly Madrid, the Basque Country, Navarre, Catalonia, Andalusia and Valencia).
- ✓ The renewable energies sector is young, with an average age of about 16 years, where almost one out of three companies has been created after 2000.
- ✓ The positive effect of the introduction of renewable energy sources on employment is increased by the characteristics of the generated employment. Thus, most of the new jobs are placed in geographical areas with little working opportunities, such as rural areas.
- ✓ The volume of the employment created in the sector is approximately 200,000 new jobs in 2010, taking into account both direct employment (manufacture, building and maintenance) and indirect one (consequence of the expenses during the stages of manufacture, building and maintenance, which translates into increase of the demand of goods coming from other economic activities or sectors)[1]
- ✓ Half of the companies linked to the Renewable Energy sector combine more or less with activities in a different sector.
- ✓ There are three activity axes most companies deal with: Photovoltaic Solar (57.6%), Thermal Solar (43.4%) and Wind (35.3%)
- ✓ Regarding the particular activities they carry out, most of them deal with Installation (52.4%), while another 21.6% carry out maintenance operations. In this context, with lower incidence, there is another 14.7% selling equipments, and about 13% producing energy.
- ✓ In the international market, dominated by the great companies, there are wide opportunities for technological diversification. They might exploit some of them that would not be profitable in developed countries' markets.
- ✓ In general, we are seeing a specialisation process, vertical integration of activities and subcontracts, leaded by the interests of the companies with the biggest capital: promoters and manufactures. The smaller companies should constitute auxiliary industry.
- ✓ The Spanish renewable industry has the necessary technology in the main energies for its domestic and international expansion.
- ✓ The suppliers: most of them (67.5%) come from the national area, although 46.5% also have European suppliers.
- ✓ The clients: the sector production is mainly aimed at domestic clients (70%). The European space is also important (23.5%). The Worldwide market is considerably restricted.
- ✓ Investment: Looking at the future, the companies think that in the close future, they will increase the percentage of investment about 19%.

[1] *Plan de Fomento de las Energías Renovables en España (Plan to Promote Renewable Energies in Spain)*

Current economic situation

- *Wind energy*

The installed turbines have risen from a unit power of 580 kW in 1999 to about 1,100 kW in 2004. The average size of the farms has also increased, up to 25 MW at present. In general the wind machines have progressed in all technical aspects (material and weight, control, availability, etc.) and at present, high power wind generators are being developed (over 2 MW), which will allow optimising the use of the sites, improving the quality of the electric energy taken to the electric power transmission network in order to contribute to stabilise the system and maximise the installable power.

This state of maturity reached by Spanish technology, together with the almost mass production of the wind generators, has allowed significant decrease of the costs in the construction and assembly of wind farms. The maturity and competitiveness of the technology used (continuously developing), the national law framework and the autonomous regulations have favoured the compliance of the objectives (the Spanish Renewable Energy Plan – 2005-2010) in force so far for the wind age and, at the same time, they have generated a specially active and dynamic business sector, with high growing expectancies in the future.

The wind objectives established by the Renewable Energy Plan for 2010 have been exceeded. There are several factors that make us think there will be greater encouragement of the wind sector in Spain:

- ✓ Wide wind potential, still unused (mainly the offshore)
- ✓ Favourable regulations, which have allowed confirming the confidence and interest of the promoters.
- ✓ Mature industrial sector with a high technological level and national manufacturing capacity
- ✓ The Autonomic Government planning supports the planned objectives.
- ✓ The introduction of technologic improvement, in the wind generators behaviour in the network, will allow a high degree of penetration of wind energy, without influencing the certainty of electric supply.

- *Solar Photovoltaic Energy*

In spite of the favourable conditions for an important increase of this activity (suitable law framework, rates making the investment attractive, easy funding of the projects, non-refundable benefits and tax incentives), most of the Autonomous Communities have little compliance of the objectives established by the Plan to Promote Renewable Energies 2000-2010.

Nevertheless, the present Spanish manufacturers of photovoltaic cells are among the most important at international level, allocating a great part of their production to foreign market. In addition, the domestic market increase and the good international perspectives made new investments appear in 2005 and new modules and cells factories started operating in our country.

The Solar Photovoltaic Energy is increasing strongly at World level and in the European Union, in the countries where suitable frameworks are defined for its development, such as Germany and Spain.

The main difficulties for the development of Solar Photovoltaics are the economic ones, which limit its development. Overcoming these barriers and promoting its development are based, among others, on the following reasons:

- ✓ Existence of very favourable solar resources for the development of this technology in Spain.
- ✓ Interest of many promoters.
- ✓ Existence of technology and manufacture capacity at national level. The Spanish industry is at a good international level.
- ✓ The national industry uses the favourable perspectives of technological and economic evolution allowing forecasting very relevant improvement in the medium term.

The still scarce profitability of the photovoltaic facilities makes it necessary that there is public support for the exploitation and only in the case of facilities isolated from investment. The public support considered for the exploitation are the bonuses defined in the Royal Decree 436/2004 which is expected to be kept to achieve the minimum necessary profits.

- *Solar Thermal Energy*

Apart from some very complex project, such as big innovative plants, which require funding and maturation processes requiring months, the conventional projects can be executed in relatively short periods, which allows planning a quick increase of the surface installed.
The reasons for the application of the solar energy in Spain are:

- ✓ Existence of very favourable solar resources for the development of this technology.
- ✓ Technical and economic suitability of the solar thermal energy to the sector of new buildings with great perspectives of development in the next years.
- ✓ Opportunity for a good part of the society to take direct part in the development of renewable energies.

- *Mini – Hydro Energy*

Hydroelectric energy has historically played and still plays an important role in the structure of electricity generation in this country, especially due to the important existing resources. Building hydraulic plants is a technologically mature and consolidated sector, with wide tradition in Spain, in which no important evolution is expected in the short or medium term (the evolution of mini-hydro in the 80s has been very favourable, although, since 1992 there has been a slight decrease of the yearly installed power). National industry is self-sufficient, high quality and is able to face important increases of new projects.
Both the project engineering of a small hydro plant and the design engineering and the detail of the main components are widely covered in the domestic market. In the last years, the main innovations have occurred in the field of control and automation, with the subsequent improvement of performances.

Job market

- *Wind energy*

In terms of employment generation in the sector, we esteem that the development of wind energy until the end of 2004 allowed employing about 95,000 workers/year. This employment generation is usually linked to the design, manufacture and assembly of wind facilities. Of these posts, approximately 24,000 are direct employment and 71,000 are indirect. On the other hand, regarding the tasks of operation and maintenance of farms, till that date, about 1,450 permanent jobs had been created and maintained for an average period of 20 years of useful life of the facilities. Employment generation of wind power:

  - Building and assembly stage: 156,000 people a year
  - Operation and maintenance: 8,400 people a year
  - Total generated employment: 164,400 people a year.

- *Solar Photovoltaic Energy*

For the period 2005-2010, it is worth underlining that we expect the creation of more than 30,000 people/year (direct full-time jobs, 1,800 h a year and 35 h a week).

- *Solar Thermal Energy*

Until 2005, the little demand of solar equipments made it difficult for the business network to develop, so the number of manufacturers of solar collectors, as well as engineering companies specialised in carrying out projects and feasibility surveys was still low. It is worth underlining that for the period 2005-2010 the creation of almost 50,000 employments a year was expected (1,800 hours a year). All this means a great social impact, also taking into account that the solar thermal sector is constituted manly of SMEs.

- *Mini – Hydro Energy*

In 2007 the small-hydro energy generated 6.600 direct employments. For 2010, a 10% increase was expected, reaching 7.320 employments.

Economic outlook Trends

- *Wind energy*

  - ✓ Planning in force for the Gas and Electricity Sectors and the suitable development of the transport networks associated, taking into account the wind objectives coming from the Plan.
  - ✓ Updating the Administrative and Technical Regulations for the Operation and connexion to the Network. It is related with the technological improvement of the wind generators, to optimise the answer of the wind farms against the network disruptions.
  - ✓ Transferring the Directive 2001/77/CE to the National laws for the promotion of Renewable Energies, regarding the guarantee of origin for electric generation with renewable sources.
  - ✓ Homogenising the administrative procedures in the Autonomous Communities, mainly the environmental ones.

- ✓ More active public participation in R&D&I for the development of national technology, specially regarding the energy quality and the unitary size of the machines (bigger than 2 MW).
- ✓ Developing tools to predict reliably enough, allowing the whole integration of wind power in the electric system.
- ✓ Developing specific laws for offshore wind parks
- ✓ Developing national wind generators with technology adapted to the offshore conditions and implementation of offshore exhibition farms.
- ✓ Developing wind farm coordination centres.

- *Solar Photovoltaic Energy*
  - ✓ Maintenance of the economic conditions set in the Royal Decree 436/2004.
  - ✓ Introduction of a task relief in the income tax for people investing on isolated photovoltaic facilities.
  - ✓ Support innovation through projects aimed at the architectonic integration, new technologies, new formulas to execute projects, etc.
  - ✓ Support initiatives for the industry to complete the production processes.
  - ✓ Increase of the retributive limit up to 400 MW.
  - ✓ For the buildings consuming energy intensively (certain uses, from certain size) make them incorporate certain power of photovoltaic generation, through the Building Technical Code.
  - ✓ Promote the coordination among Autonomous Communities to establish and homogenise the procedures.
  - ✓ Introduce the Photovoltaic facilities in the Low Voltage Electro-technical Regulation, thus completing the regulations on investors.

- *Solar Thermal Energy*
  - ✓ Support the intensification of the practise of Municipal Solar Regulations through their dissemination among the Town Councils.
  - ✓ Application of public supports to investment
  - ✓ Introduction of a tax relief on solar thermal energy in the income tax
  - ✓ Support the implementation of the tax regulations by the municipalities.
  - ✓ Specific training for the town council technicians for the evaluation of the projects related with solar energy addressed to installers, town council technicians and prescribers (architects, promoters, etc.)
  - ✓ Modernisation of the collectors' production lines to adapt them to the market demand.
  - ✓ Establishment of specific programs to carry out innovative projects with the suitable incentives.
  - ✓ Encourage the Urban Regulation General Plans to establish incentives for the use of solar energy in air conditioning, thus increasing the building possibilities.

- *Mini – Hydro Energy*
  - ✓ Harmonisation of the environmental impact requirements, establishing some criteria agreed with the Autonomous Communities, in order to establish the suitable laws within a harmonised framework and taking into account the basin unit.

- ✓ Quicker concession paperwork, thus reducing the process and making it easier.
- ✓ The initiation of the job Proceedings of Lapsing of Concession's Right for all the hydroelectric uses that have interrupted exploitation for three consecutive years.
- ✓ The creation of funding lines for investment on fixed assets for the electricity production by means of hydroelectric plants.

Reference documents and bibliography sources

- "Situación y tendencias del empleo medioambiental en España", El Observatorio del empleo y la formación medioambiental (Ecoempleo) (situation and trends of environmental employment in Spain) (Environmental employment and training Observatory (Ecoemployment))
- "Estudio Energías Renovables y generación de empleo en España, presente y futuro", Instituto Sindical de Trabajo Ambiente y Salud (Survey on Renewable Energies and employment generation in Spain, present and future) (Trade union institute on Work, Environment and Health)
- "Plan de Fomento de las Energías Renovables en España 2000 - 2010", Ministerio de Ciencia y Tecnología (Plan to Promote the Renewable Energies in Spain 2000-2010) (Ministry of Science and Technology)
- "El empleo y la formación en el Sector Ambiental en España", Fundación Entorno, Empresa y Medio Ambiente (Employment and Training in the Environmental Sector in Spain)

For main trends also:

- www.cedefop.europa.eu/skillsnet
- http://ec.europa.eu/social/main.jsp?langId=en&catId=782&newsId=534&furtherNews=yes
- Skills from green jobs" CEDEFOP 2010

Trends in the renewable energy sector in Bulgary

General Overview

Bulgaria plays a vital role in European energy security. Despite having limited reserves of coal, oil and gas, the country has a well developed energy sector. It is a major exporter of electricity to Southeast Europe, generated mainly by thermal, nuclear and hydropower plants. Bulgaria is a key transit route for oil and gas pipelines, which is of crucial importance to the Balkans and Southeast Europe as a whole. Bulgaria also has the capacity to become a leading generator of power from renewable sources, especially wind. This will require significant investment and increased efforts to build public support. Currently the public is in favour of nuclear power, which is seen as the reliable, lowercost option for households. The Bulgarian government needs to balance its desire to please the electorate with its responsibility to comply with European Union accession requirements (by retiring its old nuclear facility) and to meet EU renewable energy targets for 2020.

- *Hydro Power*

Bulgaria has been utilizing its hydrological resources for over two centuries. The country currently has 10,300 MW of installed capacity from large commercial hydroelectric power plants (HPP's). Bulgaria also has approximately 545 MW of installed capacity from small and micro (< 15 MW) HPP's (World Electric Power Plants Database, June 2009). Approximately, 3.6 billion kilowatt-hours were generated by hydroelectric power plants in 2007, so hydroelectric power makes up about 10 percent of the total power generated in Bulgaria (EIA, 2007).

Bulgaria has growth in their hydroelectric power sector. Currently, 105 MW of hydroelectric capacity are being constructed, and 190 MW of capacity have been planned. For the most part, Bulgaria's technical and economic potential for large hydroelectric plants is being fully exploited (Renewable Energy Fact Sheet, European Commission).

Bulgaria is actively working on the development of its hydrological sources in an effort to limit the dependence on foreign fuel imports. Around 63 small and micro Hydro Power Plants were located on the National Energy Company's (NEK) property, most of which have been privatized.

There are a few private sector companies who are actively involved in the development of small and micro HPP's such as Energoproekt, Hydro Ltd., AMEK, and ESD of Bulgaria. While the country does not have a hydro association, there are several organizations created on a municipal level who have taken an active interest in renewable energy sources. Municipal organizations such as the Plovdiv Energy Agency, as well as the Regional Energy Center's at Lovetch , Russe, and Haskovo - just to name a few.

- *Solar Energy*

A sizeable portion of Bulgaria's land area receives medium levels of solar radiation. The potential for energy from this resource is greatest for low temperature thermal applications, rather than electric power generation. Warm air solar heating may be utilized in a broad range of agricultural and forestry applications such as for crop dryers and wood dryers. There are some private sector companies interested in solar energy, such as Energoproekt, AMEK, Energy and Ecology Ltd., and Thermoconsult, that have done preliminary research and/or pilot project implementation.

Solar thermal energy has been utilized in Bulgaria in several applications. From 1977 to 1990, the Bulgarian government developed an energy efficiency program for the utilization of solar collectors, which amounted to the installation of 50,000 m2 of collectors or about 17 MWth.

Additional pilot and educational projects for domestic hot water heating under the PHARE program have yielded successful results, although there has not been a large increase in such projects.

Other than experimental and prototype photovoltaic projects, very little has been done in implementing solar power projects. However, approximately 20 MW of photovoltaic installations have been planned in Bulgaria, and a 1 MW PV system currently produces power in Sofia.

- *Biomass*

There is good potential for utilizing biomass as an energy source in Bulgaria. While information regarding the use and potential of biomass has been limited, there have been recent developments through pilot projects and preliminary evaluations that begin to highlight Bulgaria's full potential. In June 2008 the Council of Ministers approved a National Long-term Programme for Encouragement of the Use of Biomass for 2008-2020. This program is a roadmap for the potential use of biomass in Bulgaria. Bulgaria's first power plant running on biomass was built in the north central part of the country in 2002, and since 2003 in Southwestern Bulgaria too. Also, a plant that manufactures biomass burning heating units was opened in 2006 while Bulgaria's largest biomass facility, burning wood waste with an output of 10 MW, was opened in December 2006. Many other biomass plants have also been planned for Bulgaria. Next to the country's hydro resources, biomass accounts for a sizable share of Bulgaria's energy consumption, approximately 10 million kWh in 2007. Due to the lack of reliable nationwide assessments and data, it is estimated that in practice this number is much larger. The majority of the biomass energy consumption exists mainly in the rural areas, where fuelwood, followed by the residential consumption of wood briquettes produced from forestry wastes and sawmill byproducts amount to approximately 2 million m3per annum.

- *Wind Energy*

The wind power plants are quickly joining the front runners in the renewable energy sources group. There are a few geographical zones in Bulgaria that are suitable for the construction mainly of medium-sized wind turbines. The research and the design of such facilities must be done very carefully and conclusively due to the specifics of the wind energy.

Bulgaria's wind capacity has grown dramatically in recent years. Currently, the country has a wind power capacity of 86 MW, approximately 25 wind farms. A majority of this capacity was installed in 2008: the 35 MW farm, Kalchevo, and the 32 MW farm, Kavarna East. As of June 2009, 14.5 MW of capacity are under construction: the Bilo (4.5 MW) and Long Man (10 MW) wind farms. Approximately 1,000 MW of capacity are planned for Bulgaria.

- *Geothermal Energy*

The geothermal (form the heat of the Earth) energy is a realistic opportunity for the Bulgarian economy - there are 700 appropriate springs already documented, and whole areas with good potential. As a completely clean and practically free renewable energy source, the geothermal energy is the best

opportunity for heating and hot water supply for many communities, tourist centers and industrial sites. When appropriately designed and financed, the geothermal installations guarantee true independence.

Bulgaria has a sizable reserve of geothermal energy and is rich in low enthalpy geothermal waters. The country has been utilizing approximately 30 percent of its total potential, or about 107.2 MWt producing some 1.637 TJ of energy per year, for use in space heating, greenhouses, drinking water, and for balneology purposes (Geothrmie, 2000). At the present there are no geothermal reserve sites that generate power.

KEY FIGURES

- ✓ The share of RES in total primary energy consumption was of 6.29% in 2007.
- ✓ The share of RES in the gross final energy consumption was 9.4 % in 2005.
- ✓ The share of RES in the gross electricity production was 11.8% in 2005 (thanks to the contribution of hydropower, currently, almost the only source of RES-e in Bulgaria)
- ✓ The share of biofuels in the transport sector in 2006 was 1.5 %.
- ✓ Bulgaria energy dependence on imports amounts to 70 % in 2005.
- ✓ 11 % share of RES on gross electricity consumption by 2010
- ✓ Biofuels consumption of 5.75% of petrol and diesel use for transport in 2010.
- ✓ Wind energy has large-scale prospects, with up to 3,400 MW of installed capacity potential. As of 2009 Bulgaria operates more than 70 wind turbines with a total capacity of 112.6 MW, and plans to increase their number nearly threefold to reach a total capacity of 300 MW in 2010.

Current economic situation

Key points

- ✓ The share of RES in total primary energy consumption was of 6.29% in 2007
- ✓ Bulgaria has huge renewable energy resource potential (especially wind) but needs major investment in technology, infrastructure and capacity
- ✓ Existing nuclear power plants seem a low-cost option, due to subsidies and previous up-front investment
- ✓ Consumers are concerned about cost, while the government needs to meet EU renewable energy targets for 2020
- ✓ The government needs to improve its promotion of renewable energy investment opportunities
- ✓ The energy sector needs to address corruption and monopolisation and increase transparency and public participation

Current power generation: thermal, nuclear and hydro-power

Bulgaria currently has about 12,668 MW of installed power generation capacity, including thermal (gas), nuclear and hydro-power, and exports electricity to Southeast Europe.

The government is now seeking foreign investment to expand its power sector, as several of the current sources of power are undergoing review. Bulgaria also imports over 70 per cent of the fuel required for power generation and is therefore keen to develop a power sector based more on local resources.

Players on the Bulgarian RES Market – developers, suppliers, strategic investors

Key institutions on the Bulgarian RES Market are the Ministry of Economy, Energy and Tourism, the State Commission for Energy and Water Regulation and the 3 energy networks concessioners - EVN, e.ON and CEZ. These are the primary institutions, according to the proposed new Act on RES, which will engineer the development of the sector in the coming years.

Major providers of services and equipment come from Germany, Austria, Japan and the USA as these form the upper price segment of the market. Alternatively, companies from China and India provide lower cost products.

In terms of strategic investors in the PV and WP projects, along with Bulgarian companies, entities from China, Austria, Germany, Japan, Korea and the USA prove long term interest in developing scalable RE generating facilities in Bulgaria. Some of the major stakeholders in PV and WP projects in Bulgaria include the Japanese Mitsubishi, Sharp and Heavy Industries, the American AES, the Italian ENEL, the German We2, the Korean SDN etc. Allegedly, the National Energy Company – NEC, is also planning the development of largewind power facilities. A projected 56 MW power plant is to be built up until 2012 at the cost of 43 million euro.

Job market

There is a lack of reliable nationwide assessments and data in this field.

Economic outlook Trends

Bulgaria's renewable energy potential

Despite a limited legal and economic framework for developing a renewable energy sector, Bulgaria has considerable renewable energy potential, as demonstrated by numerous research findings over the past 30 years.

Except for solar, Bulgaria has very promising renewable development opportunities. Bulgaria is one of the top countries identified for wind energy development (3,400 MW mid term potential). Despite limited legal and economical framework, Bulgaria has tremendous wind energy potential and state-of-the-art wind data supporting development. Bulgaria has a sizable reserve of geothermal energy and is rich in low enthalpy geothermal waters used for space heating, greenhouses, drinking water, and balneology. In addition, there may be the potential for up to 200 MWe electricity generation from geothermal wells, but more conclusive reports must be completed for verification. Considering that approximately 90 percent of the country's land is arable, agricultural land, or forests, the potential for the development of biomass projects looks

promising with about 3,400 MWe of technical potential identified. The Bulgarian government believes that in upcoming years there will be a great interest on the part of investors in the field of hydroelectric power, specifically small and micro hydropower plant projects. As part of the National Energy Strategy till' 2020, the State envisages efficient water resource utilization as one of its main objectives. The State anticipates this can be achieved in two ways: through the privatization and rehabilitation of existing hydro plants and the construction of new hydro plants. Although Bulgaria resides in an area with medium solar insolation the current low cost of heat and electricity may make the overall capital costs of solar energy uneconomic.

According to European Union statistics, a total of 120 MW of wind power capacity was installed in Bulgaria between 2007 and 2009, bringing the total to 177 MW. This increased to 336 MW in 2010 and is expected to reach 1,250 MW by 2020.

Bulgaria also has substantial potential for generating power from biomass.

About 90 per cent of Bulgaria's land is arable, agricultural or forested land. Bulgaria also has large reserves of geothermal waters used for heating, greenhouses, drinking water and bathing. There is an estimated potential for up to 200 MW of geothermal power generation, subject to verification.

The country already has considerable hydropower potential and this sector could be expanded.

The government and green energy

In February 2008, the Bulgarian government set up a 100 per cent state-owned energy holding company, Bulgarian Energy Holding EAD, in order to improve the corporate management and supervision of the energy sector. To promote diversification of their energy sources, the Bulgarian Energy Efficiency and Renewable Energy Credit Line has been set up by the EBRD, with renewable energy projects being eligible for a 20 per cent grant. Loans of over 12.8 billion euros have already been granted. Efficient use of water resources is a key objective of the National Energy Strategy to 2020, with a focus on privatisation and rehabilitation of existing hydropower plants and construction of new ones, mainly on the River Danube. The government anticipates particular interest on the part of investors in small-scale and micro-hydropower projects.

The government is currently financing various renewable energy projects in an effort to meet the EU renewable energy requirements for 2020, while several other projects with foreign investment are under construction or in operation.

Reference documents and bibliography sources

- National Renewable Energy Plan 2010 (NREAP 2010), Bulgaria
- European Bank for Reconstruction and Development (2010) Country profile: Bulgari
- Stefanov, R., et al. (2011) Energy and good governance in Bulgaria: Trends and Policy options. Center for the study of Democracy, Sofia. Bulgaria.
- Ministry of Energy and Economics (2008) National Energy Strategy

- NATIONAL RENEWABLE ENERGY ACTION PLAN, Ministry of Economy, Energy and Tourism, 30 June 2010

Trends in the renewable energy sector in Finland

General overview

In the website for renewable energy sources from the Ministry of Employment and the Economy contains overviews of the Finnish renewable energy sources such as:

"Finland is one of the world's leading users of renewable sources of energy, especially bioenergy. Renewable energy sources provide one fourth of Finland's total energy consumption and account for more than one fourth of its power generation. The country's most important renewable sources of energy include bioenergy – wood and wood-based fuels in particular –, hydropower, wind power, ground heat and solar energy. The objective of the national energy and climate strategy is to increase the use of renewable sources of energy and their share of energy consumption. In addition to energy conservation, this is one of the most significant means by which Finland's climate targets can be achieved. In use, renewable energy sources do not increase carbon dioxide emissions, while promoting employment and regional policy goals and enhancing security of supply. The strategy also supports technology exports for the industry, which are already becoming an important part of Finnish exports.

In Finland, peat is classified as a slowly renewable bio mass fuel. With a share of approximately 6 per cent, it holds a significant position in our energy balance. As a domestic fuel, peat has an important impact on regional policy and employment, and is having a growing effect on security of energy supply. The national energy and climate strategy aims to maintain the position of peat as a competitive alternative in energy production."

http://www.tem.fi/index.phtml?l=en&s=2481

Overview of energy situation in Finland

In Wikipedia it is provided a detailed description of energy situation in Finland from which we also can read the following extract;

Overview of renewable energies in Finland

"There was no sustainable decline in CO_2 emission in Finland during 1990-2007. The energy use decline 2008-2009 is based on recession and at least some paper industry factories relocation abroad. The annual changes of CO_2 emissions of Finland were in some years 7-20 % during 1990-2007. Increase of emissions was 18 % in 1996 and 20 % in 2006. The peat energy use and CO_2 emissions per capita had correlation in 1990-2007."

Consumption of energy in Finland

"Energy consumption increased 44 percent in electricity and 30 percent in the total energy use from 1990 to 2006. The increase in electricity consumption 15,000 GWh from 1995 to 2005 was more than the total hydropower capacity. The electricity consumption increased almost equally in all sectors (industry, homes, and services). The share of electricity generated from renewable energy in Finland has been stable from 1998 to 2005: 11 to 12 percent plus yearly changing hydropower, together around 24 to 27 percent. The RE of total energy has been 24 percent (1998 to 2005). The forest industry black liquor and forest industry

wood burning were 57 percent (1990) and 67 percent (2005) of the RE of total energy. The rest is mainly water power. The most of available hydropower for energy is already in use. The forest industry uses 30 percent of all electricity in Finland (1990–2005). Its process wastes, wood residues and black liquor, gave 7000-8000 GWh RE electricity in 2005. In the year 2005 this and electricity consumption fell 10 % compared to 2004 based on the long forest industry strike. Finland consumed (2005) 17.3 MWh electricity per capita compared to Germany 7.5 MWh per capita. This number includes the power losses of the distribution." http://en.wikipedia.org/wiki/Energy_in_Finland

Overview of renewable energy in Finland

In a separate location within Wikipedia we can also obtain an extensive overview of renewable energy in Finland and from which the following summary extract has been quoted;

"Renewable energy in Finland of electricity was (2005): Water 60%, forest industry black liquor 22%, other wood residues 16%, wind power 0.2% and other RE 1 %. The European objectives are: 22% renewable source electricity and 12% renewable of primary energy in 2010 (directive and white paper). This includes e.g. the objectives of 40 GW wind power, 3 GW PV and 5.75 % biofuels (2010). The wind power objective was reached in 2005. The leading wind power countries have set new, more ambitious goals.

Olkiluoto 3 nuclear plant represents 85% of Finland's planned investments in new power generation between 2006-2010. Investments in new renewables, including wind and solar heating, is negligible. Renewable energy targets (wind, solar, biogas, biofuel) have not been taken seriously or binding in the energy politics development program as Finland will not fulfill even its modest national renewable energy targets for the year 2010." http://en.wikipedia.org/wiki/Renewable_energy_in_Finland

Current economic situation

The Energy Department of the Finnish Ministry of Employment and Economy produced in mid 2010 a national action plan for promoting energy from renewable sources from which we can extract the following current economic situation and national policies;

"The main outlines of the approach to increasing the use of renewable energy are set out in the Long-term Climate and Energy Strategy submitted as a report to the Finnish Parliament in November 2008 (VNS 6/2008 vp). On account of the general development of the economy and the structural change taking place in the forestry industry, the government supplemented these outlines in April 2010. The general approach to increasing the use of renewable energy as primary energy is described below on a source-by-source basis, indicating the economic instruments to be used to promote each energy source. In 2020 it is estimated that 56 TWh will be available in fuels dependent on forestry industry production (residual lyes and industrial wood waste).
The estimate is based on the production of 13.7 m tons of paper and board. It is estimated that in the same year renewable energy sources yielding 77 TWh will be the subject of policy measures, as against 37 TWh in 2005. Final energy consumption in 2020 is estimated at 327 TWh.

- *1. Wind power*

According to the Climate and Energy Strategy, wind power production will rise to 6 TWh by 2020. In order to promote wind power, there are plans to introduce a market-based feed-in tariff scheme in 2011, to be funded from the State budget. The feed-in tariff will be equivalent to the difference between the target price and the market price of electricity. The intention is to set the target price for electricity production as part of the feed-in tariff scheme at € 83.50 per megawatt-hour. However, until the end of 2015 the target price for electricity produced from wind power would be €105.30 per megawatt-hour, on the basis of which the feed-in tariff would be paid for a maximum of three years. The feed-in tariff would be paid only to new wind power plants. A power plant receiving the feed-in tariff would not be eligible for any other State aid. The costs of the support scheme with a production of 6 TWh are estimated at around €23 m in 2011 and around €210 m in 2020, if the market price of electricity is €50 per megawatt-hour. Wind power plants which were not covered by the feed-in tariff scheme would continue to receive a fixed subsidy of €6.90 per megawatt-hour. €1.5 m per annum is to be earmarked for promoting the planning of construction of wind power capacity.

- *2. Biomass*

At present the potential scope for wood chips and other enerby from wood is not being fully exploited. The use of wood chips in CHP production and separate heat production will be increased to 13.5 million m3. This is equivalent to at least 28 TWh of fuel. In 2009 some 5 million m3 of wood chips were used. The target for use of wood chips in the Climate and Energy Strategy was 12 million m3 in 2020. The bulk of the growth in the exploitation of forest energy should be achieved using small-sized wood and stumps, but of these, the harvesting costs of small-sized wood in particular are currently too high for energy undertakings to afford. There is therefore a need for new forms of support to increase the use of forest energy. In order to increase the use of forest energy, a three-part aid package has been devised which will increase the competitiveness of forest energy to a level at which the required growth can happen. The support package to be presented comprises energy support for small-sized wood, a feed-in tariff to compensate for the difference in costs between wood chips and alternative fuels, and a feed-in tariff for small CHP plants.

Energy subsidies for small-sized wood. The existing subsidies under the Sustainable Forestry Financing Law ('Kemera') would remain as they are in other respects, but the subsidies would be restricted to cases where the remaining tree has a diameter of less than 13 cm at chest height (the present limit is 16 cm). Energy support for small-sized wood could be paid for all wood chips obtained from trees at first thinning and made available for energy use. The support would not be paid for use of timber as a material but only for energy use. Restricting area support and harvesting support under the Kemera to trees with smaller diameters would be more effective than the current system in encouraging the performance of forestry management measures in good time. Energy support for small-sized wood would improve the viability of integrated wood harvesting during first thinning, so that it would also have a favourable impact on the supply of pulpwood to the forestry industry. In this way the system would also increase first thinning. According to an initial rough estimate, the costs of energy support for small-sized wood would be approximately €18 million under present conditions and approx. €36 million in 2020. Arrangements for introducing energy support for small-sized wood are in preparation.

Support for electricity production from wood chips (feed-in tariff). The greatest problem in increasing forest energy is wood's poor competitiveness with fuels which cause carbon dioxide emissions while prices of carbon emission permits remain low, or in other words energy plants' inability to afford the forest energy to be obtained. At nearly all the power stations in Finland where wood is used, the 'ability to pay for wood' is calculated on the basis of the price of peat and the cost impact of emission permits for peat.

The effect of fluctuations in the price of emission permits can be stabilised by linking electricity production support to the price of emission permits, in which case the competitiveness of forest energy is guaranteed in relation to peat, irrespective of the price of emission permits. Variable production support for electricity would increase the proportion of the fuel for Finland's energy production accounted for by wood chips.

It is planned that production support for electricity produced from wood chips (a feed-in tariff) should be introduced from the beginning of 2011, as follows:
A market-based feed-in tariff scheme will be introduced, to be funded from the State budget. The support (feed-in tariff) will be paid for electricity produced using wood chips. The scale used to determine the support would be such that when the cost of an emission permit was €10 per ton of CO2, the support would be €18/MWh, and when the cost of an emission permit was €23 per ton of CO2, the support would be €0/MWh. If the cost of an emission permit rose to €20 per ton of CO2, the support would be less than the tax subsidy currently payable under the Electricity Tax Law (€6.90/MWh). By means of production support it would be possible to obtain some 19 TWh from wood chips. With the current price of emission permits, the additional cost of the support would be more than €10 million per annum, as electricity generators would no longer receive tax subsidies under the Electricity Tax Law for electricity produced from wood chips. In 2011 the total cost of the support is estimated at €27 million, and in 2020 at around €22 million. Electricity production from wood chips not covered by the feed-in tariff scheme would continue to benefit from a fixed subsidy of €6.90 per MWh. It is intended that the use of coal to produce electricity and heat (currently around 15 TWh) should be partially (7-8 TWh) replaced with renewable biofuels. The work to determine the economic instruments to be used is under way, but the intention is to assess the feasibility of variable production support and investment subsidies.

Feed-in tariff for small CHP plants. It is possible to use the heat loads of municipalities and industry more effectively by replacing heat boilers with small CHP units. However, the cost of generating electricity in small CHP plants is higher than the market price, and support is needed for the investment. A feed-in tariff scheme is used as an instrument to support small CHP units using wood fuel. It is intended that a feed-in tariff for small CHP units should be introduced at the beginning of 2011 as follows:
A market-based feed-in tariff scheme will be introduced, to be funded from the State budget. The feed-in tariff will be equivalent to the difference between the target price and the market price of electricity. The target price for electricity produced using wood fuel at a power plant covered by the feed-in tariff scheme would be € 83.50 per megawatt-hour. In CHP production, in addition, a heat premium of €20 per megawatt-hour would be paid for electricity produced from wood fuel by way of a supplement to the feed-in tariff. The maximum feed-in tariff would be limited per plant, and would not exceed €750 000 per annum for any one plant. The feed-in tariff would be paid only to new power plants. A power plant benefiting from the feed-in tariff would not be eligible for any other State aid. The intention is to channel aid so that it is most remunerative to new plants with a capacity of less than 3 MW and a thermal input of around 20 MW. The size category would correspond to the size limit for emissions trading.

The feed-in tariff for small CHP plants will facilitate as many as 60 new investments by 2020 and increase the use of wood fuel by 1-1.5 TWh. However, the increase in electricity generation secured in this way is estimated to be relatively small – some 0.2 TWH – on account of the low power to heat ratio of small CHP plants. The cost of the support scheme is estimated at around €3.75 million in 2011 and around € 34 million in 2020 if the market price for electricity is €50 per MWh.

- *3. Other renewable energy sources*

Hydro power. According to the Climate and Energy Strategy, hydro power production is to be increased by around 0.5 TWh per year of average water flow, to 14 TWh in 2020. The increase comprises increased capacity at existing power plants and small hydro power. Small hydro power is promoted by means of the existing investment support scheme (energy support). The Ministry of Employment and the Economy is drafting an amendment to the guidelines for granting support which will make it possible to grant support for plants of up to 10 MW, rather than the current maximum of 1 MW. Electricity generated from hydro power will continue to benefit from a fixed subsidy of €4.20 per MWh.

Small-scale use of wood. The aim is to maintain the use of small-sized wood for heating purposes at its present level of 12 TWh. Improving the energy efficiency of buildings reduces the specific consumption of heating, as well as the amount of wood used on a small scale. There are plans to increase the flexibility of demand on the electricity market by means of hourly metering. Hourly metering makes it possible to apply electricity tariffs which vary hour by hour. This provides incentives to use wood as a source of extra heating when the market price of electricity is high.

Heat pumps. Renewable energy production by heat pumps should be increased to 8 TWh by 2020. Measures to promote this are currently being prepared.

Transport biofuels. The use of transport biofuels is to be increased to 7 TWh by 2020. The target quoted in the Climate and Energy Strategy was still 5 TWh. Promotion of the use biofuels would be based primarily on a distribution obligation incumbent on vendors of transport fuels. The aim is to set the biofuel distribution obligation as high as 20% (taking into account the double counting referred to in the RES Directive) in 2020. Use of biofuels will also be promoted by means of the tax reform which is being prepared. In Finland it may be possible to construct capacity to produce between 120 000 and 150 000 tons of cereal-based bioethanol. This quantity could cover some 15% of the aforementioned 7 TWh target. Production would take place on a commercial basis, but it is estimated that some €120 million in investment could be financed by means of normal aid to businesses. One precondition for the support is that cereals-based bioethanol should comply with the sustainability criteria laid down in the RES Directive.

Biogas. According to the Climate and Energy Strategy, the use of biogas should be increased to 0.7 TWh by 2020. In order to promote CHP production using biogas (reactor plants) a market-based feedin tariff scheme will be introduced, financed from the State budget. The feed-in tariff will be equivalent to the difference between the target price and the market price of electricity. The tariff will be paid only to new power plants. The target price for electricity produced from biogas covered by the feed-in tariff scheme would be €83.50 per MWh. In CHP production, in addition, a heat premium of €50 per megawatt-hour would be paid for electricity produced from biogas by way of a supplement to the feed-in tariff. The cost of the biogas electricity support scheme is estimated at around €2 million in 2011 and around €10 million in

2020 if the market price for electricity is € 50 per MWh. Electricity generated from biogas not covered by the feed-in tariff scheme will continue to benefit from a fixed subsidy of €4.20 per MWh. Use of landfill gas will be promoted using the energy subsidy.

Pellets. The target for use of pellets is 2 TWh in 2020. Measures to promote this are currently being prepared.

*Recycled fuels as part of renewable.*The target for recycled renewables is 2 TWh. The use of recycled fuels is subsidised, *inter alia*, by means of a fixed subsidy payable on the basis of electricity generation at the rate of €2.40 per MWh.

Other small-scale renewable. Support for solar *heating* and solar power generation systems will continue with the aid of the energy subsidy in accordance with current practice. In the case of one-family houses, solar heating systems are promoted through the tax system by granting an offset for the household."
http://ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_finland_en.pdf

In addition to above mentioned Ministry report it is also possible to explore trends towards 2020 in the Renewable Energy Industry Roadmap for Finland available at;
http://www.repap2020.eu/fileadmin/user_upload/Roadmaps/REPAP_-_Finland_RES_Industry_Roadmap.pdf

Job market

The RES COMPASS initiative has explored the job profiles of also Finland and the result is summarized on the Renewable Energy Sector Compass website which includes both a summary of key players within the sector as well as indications on job demands. The summary on the Finnish job market, in terms of its key players and the job demand has been quoted below;

"Key Players Energy markets in Finland are based on free enterprise and open competition. The electric power industry in Finland has been open for competition since the new electricity market legislation in 1995. At the same occasion Finland joined the joint Nordic electricity market area where spot prices for electricity are determined at the common electricity exchange Nordpool. Power can be bought and sold freely in Finland, Sweden, Norway and most parts of Denmark.

For district heat there is no national market for technological reasons, as heat cannot be transported over long distances. However, district heat is largely produced by the same energy companies in centralised district heating plants or CHP plants. Locally there is usually only one district heat provider available, which means that the competition takes place between alternative heat sources. Biomass fuels and peat are commonly used for district heating. Some district heat is also sold in small scale by local entrepreneurs who produce it with biomass fuels. The government company for promoting energy efficiency, Motiva, has a program for promoting small scale heating entrepreneurship.

In the Nordic electricity market, each country is independently responsible for its transmission grid. In Finland the local distribution grids are owned primarily by local energy companies. The national transmission grid is owned by the Fingrid corporation which for its part is owned jointly by the state, energy companies and financial investors. Major changes in the ownership of Fingrid are expected as new EU legislation will forbid energy producers from owning parts of the transmission grid.

The largest electricity producers in Finland are Fortum, the state energy company, Pohjolan Voima, the energy company owned by major industries, Teollisuuden Voima, the industry-owned nuclear power company, Helsingin Energia, the power company of Helsinki City, and Vattenfall, the largest energy company of Sweden. There are also a large number of small and medium-sized local energy companies. A special feature of the Finnish electricity markets is companies like Pohjolan Voima and Teollisuuden Voima that operate with the Mankala-principle. That is, they do not pay dividends, but rather provide power to their owners without seeking profit.

Moreover, many of the industrial corporations are themselves major energy producers as in a number of factories process wastes are used as fuels. In most cases such fuels originate from wood processing and, therefore, count as renewables. Thus major producers of bioenergy in Finland include all the major wood and paper industry corporations: Stora-Enso, UPM and M-Real. Furthermore, the national oil company, Neste Oil, is a growing producer of biofuels and biodiesel in particular. Largest hydropower producers are the state-owned companies Fortum and Kemijoki and the industry-owned Pohjolan Voima. The largest producer of wind power in Finland is the Hyötytuuli corporation, owned by the energy companies of various cities. Hyötytuuli produces about one third of wind power in Finland. The rest is produced by a large number of companies in relatively small power plants.

One small, but interesting player is St1, a Finnish energy company who states as their vision “to be the leading producer and seller of CO2 aware energy”. The company researches and develops economically viable, environmentally sustainable energy solutions, and their energy services cover everything from energy consultancy to heat production solutions and wind power. They operate in Finland, Sweden and Poland.

The largest producers of RES technology in Finland are

- ABB, produces among other things components to wind power plants.
- WinWind, producer of wind power plants.
- Foster Wheeler and Metso Power, producers of boilers for biomass and other fuels.
- NAPS Systems, producer of solar power systems.

Smaller companies that produce energy-related clean technology include Aidon, Bearing Drive Finland, DGT Direct Granulation Technology, EcoSir, Finnish Electric Vehicle technologies, Greenvironment, Modilis, Primet, Puhdas Energia and The Switch.

Energy efficiency in Finland is promoted by the state-owned company Motiva. Public funding for the development of new technologies is primarily distributed by the Finnish Funding Agency for Technology and Innovation Tekes.

Job Demand

Electricity and district heat production employed 14 000 people and oil refining and distribution 13 500 people out of the 2 500 000 people employed in Finland in 2003. Bioenergy sector employed an estimated 6000-7000 people. The total employment in the energy sector amounted to 34 000 people in 2004.

The major renewable energy sources, namely hydropower and bioenergy are produced in a large scale, where business models and jobs are similar to other large-scale energy production. There is additionally small scale production of renewable energy that tends to generate small enterprise and a proportionally greater amount of jobs. For example, the Ministry of Employment the Economy has conducted a research that found that there are 368 small bioenergy companies that provide 1 667 jobs. The amount of companies and jobs has grown steadily in the past years and the growth is expected to continue given the ambitious goals for bioenergy in the national climate and energy strategy. Given that there is established production of wind power plants and plant components, the increased use of wind power in Finland and elsewhere can be expected to create jobs in the sector. This would generate demand for professionals of all levels in mechanical, material and electrical technology. Similar demand can be expected from the increased use of bioenergy and the production of the necessary power plant components. Professionals in chemistry and life sciences and related fields will be needed for the envisioned development and production of the next generation of biofuels. They will also have an important role in developing the forest industry towards more versatile biorefineries instead of traditional pulp and paper mills.

Finally the strengths of the Finnish electronics industry and education can give rise to a variety of clean technologies such as solar power (e.g. roll-to-roll PV panels), control systems for power production and consumption, electric vehicles, etc." http://www.rescompass.org/suomen,7

Economic outlook Trends

The Finnish government has set a number of country targets and key issues which the country as a whole needs to address, these can be summarized as follows;

Country targets. The renewables targets are calculated as the share of renewable consumption to gross final energy consumption. Renewables consumption comprises the direct use of renewables (e.g. biofuels) plus the part of electricity and heat that is produced from renewables (e.g. wind, hydro), while final energy consumption is the energy that households, industry, services, agriculture and the transport sector use. The denominator for the RES share includes also distribution losses for electricity and heat and the consumption of these fuels in the process of producing electricity and heat. *Finnish target: 38% (2005 = 28.5%).*

Key issues. Finland is nearing its RES-E target for 2010, and continues to adjust and refine its energy policies in order to further enhance the competitiveness of RES. Through subsidies and energy tax exemptions, Finland encourages investment in RES. Solid biomass and large-scale hydropower dominate the market, and biowaste is also increasing its share. Additional support in the form of feed-in tariffs based on purchase obligations or green certificates is being considered for onshore wind power. Biomass is the most important renewable energy source in Finland, with its use accounting for about 20% of primary energy consumption.

Main supporting policies. Finland has taken the following measures to encourage use of RES-E: o Tax subsidies: RES-E has been made exempt from the energy tax paid by end users. o Discretionary investment subsidies: new investments are eligible for subsidies up to 30% (40% for wind). o Guaranteed access to the grid for all electricity users and electricity-producing plants, including RES-E generators (Electricity Market Act – 386/1995).

Taxes imposed on heat are calculated on the basis of the net carbon emissions of the input fuels and are zero for RES. Further encouragement of RES-H takes the form of direct biomass investment support. Feed-in tariff for biogas plants is in the agenda of current government; it is planned to start in 2008 and to include plants of up to 20MW. Biofuels benefit from tax exemptions under certain conditions. Biogas used as motor fuel, for instance, is exempt from excise duty. A new law on the promotion of biofuels will enter into force on 1 January 2008; this will oblige fuel distributors to supply a minimum of 2% biofuels to the transport market in 2008, with annual increases so that it will be at least 5.75% by 2010.
A new law on the promotion of biofuels was enterd into force on 1 January 2008; this will oblige fuel distributors to supply a minimum of 2% biofuels to the transport market in 2008, with annual increases so that it would be at least 5.75% after 2010."

http://www.energy.eu/renewables/factsheets/2008_res_sheet_finland_en.pdf

For further in depths studies of the Finnish renewable energies sector and its economic outlook please refer to the websites and reference documents provided below, as well as review the graphical illustrations of the Finnish energy profile available as Annex 1 of this summary report.

Reference documents and bibliography sources

- Renewable energy sources, Ministry of Employment and the Economy, http://www.tem.fi/index.phtml?l=en&s=2481
- Energy in Finland, Wikipedia, http://en.wikipedia.org/wiki/Energy_in_Finland
- Renewable energy in Finland, Wikipedia, http://en.wikipedia.org/wiki/Renewable_energy_in_Finland
- Finlands national action plan for promoting energy from renewable sources, Min. of Employment and the Economy, http://ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_finland_en.pdf
- Renewable Industry Roadmap for Finland, REPAP 020, Fraunhofer ISI/Energy Economics Group; http://www.repap2020.eu/fileadmin/user_upload/Roadmaps/REPAP_-_Finland_RES_Industry_Roadmap.pdf
- RES COMPASS website, RES, http://www.rescompass.org/suomen,7
- Finland energy profile, energici.com, http://www.energici.com/energy-profiles/by-country/europe-a-l/finland
- Finland–Renewable Energy Fact Sheet,http://www.energy.eu/renewables/factsheets/2008_res_sheet_finland_en.pdf

Trends in the renewable energy sector in France

General facts

France and the European Union launched ambitious renewable energy policies: in 2020, renewable energies (hydroelectric, solar, wind energy, biomass or geothermal sources) should represent at least 20% of European Union's total energy consumption.

National binding targets are going to be set for the ten coming years.

Concerning France, the share of renewable energies will increase from 10,3 % to 23 %.

Among all renewable energies, we will have a closer look on those provided by the sun, wind, waterfalls and tides.

These energies are inexhaustible and do not produce any waste.

Their use is developing and should enable the progressive replacement of current sources of energy production in the near future, by limiting greenhouse and moderating the exhaustion of fossil energy (oil, coal and gaz).

- *Solar:*

  - Solar photovoltaic: Sunlight is transformed into electricity, which allows to supply areas that are isolated or difficult to connect. And when the quantity of energy produced is enough, it allows to supply the distribution grid.
  - Solar termal: Production of hot water, which will be used for heat and/or bathrooms.

- *Wind:*

  - Wind turbines set in motion by the wind produce electricity that can be used locally or injected in the distribution grid.
  - Mechanical pumps are activated by wind devices, and are used to pump water from wells, or to grind grains (windmills).

- *Hydropower:*

  - Waterfalls move turbines connected to generators which produce electricity. Electricity supplied for small installations are consumed locally, and electricity for greater installations is redistributed.
  - Tidal power stations installed on the sea shore also supply distribution grids in electricity.
  - Mechanical water mills are used to grind grains.

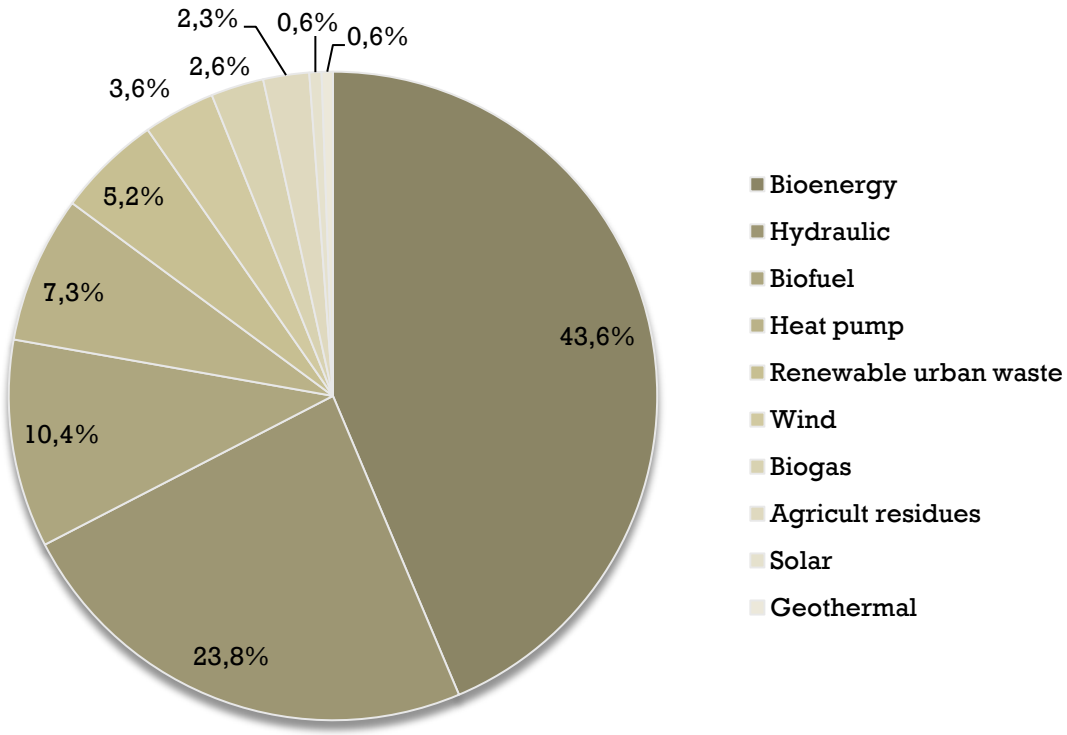
General economic facts

France is rich in renewable energy ressources. It has the biggest forest in Western Europe and a strong potential in hydraulic, wind and geothermal. In 2009, France is the second producer and consumer of renewables energies in Europe.

Production of renewable energies by sector in 2010

Renewable energies	Mtep	
Bioenergy	10,1	43,6%
Hydraulic	5,5	23,8%
Biofuel	2,4	10,4%
Heat pump	1,7	7,3%
Renewable urban waste	1,2	5,2%
Wind	0,83	3,6%
Biogas	0,61	2,6%
Agricultural residues	0,53	2,3%
Solar	0,14	0,6%
Geothermal	0,13	0,6%

Source :*Observation and Statistics Office of the French Ministry for Sustainable Development (SoeS)*



In 2010, the primary production of all kinds of renewable energies (electric and thermal) was about 23 Million Tonnes of Oil Equivalent (Mtoe), which represented about 16% of the national energy production.

Energies that we are interested in : hydraulic (23,8%), wind (3,6%) and solar (0,6%), represent about 28% of the total production of renewable energies.

Current economic situation

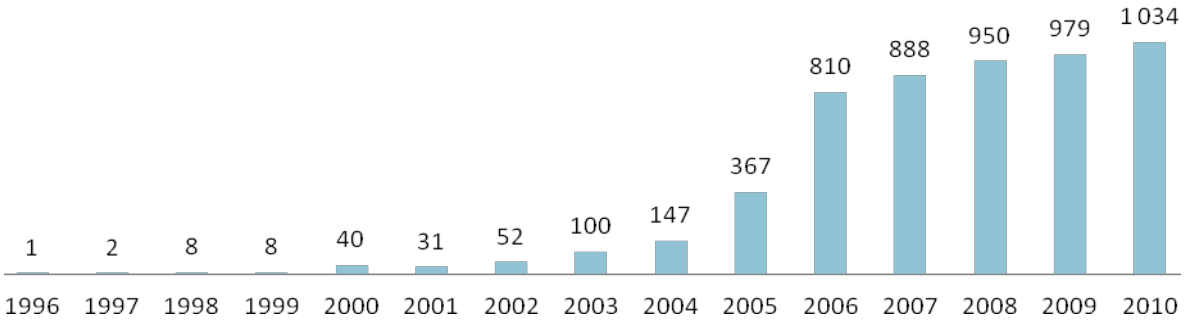
General facts concerning electricity production (hydraulic, wind and solar photovoltaic)

	Hydraulic	Wind	Solar photovoltaïc
Power installed in 2010 (MW)	25 717	6 253	1 679
Production in 2010 (GWh)	67 542	9 988	656
Goals for 2020 (MW)	29 000	25 000	5 400
Employment in 2010	10 939	9 520	24 310

Turnover in 2010 (billions of euros)	6,95	2,90	4,60

Wind power connected to the electrical grid

Growth of wind power installed annually in France since 1996 (MW)

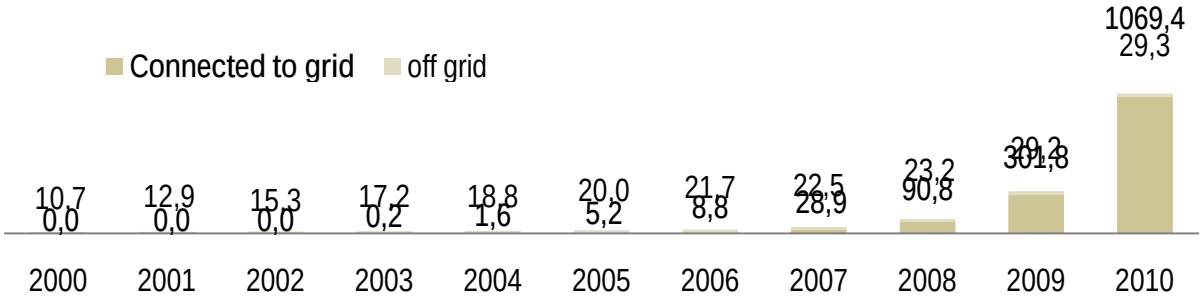


Source : SOeS

The share of electricity produced by wind power in France has significantly increased these last few years.

Solar photovoltaic park (Metropolitan France and Overseas territories and departments of France)

Cumulative total power installed in France (in Mwc)



Source : SOeS

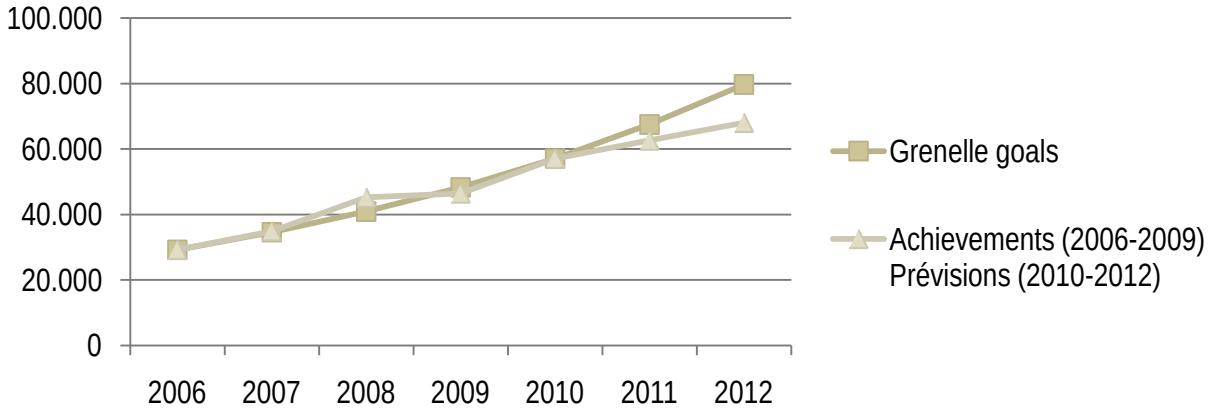
Electricity produced by solar photovoltaic energy has also significantly increased, especially the share connected to grid. This fact is explained by the encouragement of the French government, which provides financial support for the installation of such facilities.

Employment

The majority of jobs are in installation, operation and maintenance of these production facilities.

Equipment companies offer jobs as well, such as companies specialized in solar panels, wind turbines or in hydraulic installation.

Today, the renewable energies sector counts less than 70 000 employees in France. In 2020, it should count around 300 000 employees.



Source : French Agency for the Environment and Energy Control (ADEME)

However, like in other sectors, the crisis clearly slowed down the renewable energies job market.

Training

Companies of this sector always have a shortage of qualified employees, especially fitters.

Today, in initial training, there are too few trainings specialized in renewable energies.

There are several professional degree programs offering a specific curriculum at the Bachelor's and Master's level. However there are very few ones at lower levels, from high school (e.g. the C.A.P, a French Certificate of Professional Aptitude) to two-year programs in higher education, while nowadays the demand for new skills at these levels is high. As a consequence, companies often prefer to hire employees who hold a professional certificate (e.g. B.T.S or D.U.T, French vocational certificates obtained

over two years) whose specialization are in plumbing, heating, electromechanics, roofing, electricity and train their recruits in-house.

The GRETA network of the Aix-Marseille Academy offer specific trainings in installation and maintenance of solar photovoltaic and thermal panels:

- Certificate of Professional Qualification (CQP) in Installation and Maintenance of Solar Photovoltaic and Thermal Systems
- Renewable and solar energies in buildings and public works.
- Training in renewable energies, solar systems and roofing (QualiPV BAT)
- Solar and thermal installation (QUALISOL)
- Leading a Photovoltaïc business proposal

The French Conservatory of Arts and Crafts (CNAM PACA) also offers a training in renewable energies in energy-saving habitats.

Economic outlook Trends

Eco-industries as a whole, meaning renewable energies, energetic efficiency of building and transports, water treatment, waste management, cleanup of sites and preservation of natural sites, represent a major opportunity for France. There is a potential to gain 50 billion euros from additional activities and 280 000 new jobs by 2020.

The data below shows that regarding the production of electricity coming from renewables, and according to the goals set for 2020, the production of hydraulic should increase a little (+12%), while wind and solar photovoltaic production should be multiplied by 4 and 3.2, respectively.

	Hydraulic	Wind	Solar photovoltaïc
Power installed in 2010	25 717	6 253	1 679
Goals for 2020	29 000	25 000	5 400

There are prospects for considerable growth for medium or long term, particularly in solar, wind and geothermal.

But these sectors still represent a small part in activity and employment, and without proactive policies, their development is unsure.

How to not miss the opportunity for growth ?

France already has a solid base and has many assets.

Authorities have a major impulsing and supporting rôle to play ; they have to put appropriate industrial strategies in place.

The efficiency of these strategies requires the mobilization of all actors, as well as of concerned sectors : research, education, business clusters...

According to the French Committee for Renewable Energies (CLER) : « Green energies, they are the sector with the greatest potential for creating employments in France, in the coming years ! ».

Reference documents and bibliography sources

- http://www.energies-renouvelables.org/
- http://www.developpement-durable.gouv.fr/8-energies-renouvelables.html
- http://www.lemarchedutravail.fr
- http://www.ademe.fr
- « terra eco » Special edition of December 2011-January 2012.

Trends in the renewable energy sector in Lithuania

Renewable Energy Resources Consumption is a key target of the National Energy Strategy and the Law on Energetics of the Republic of Lithuania. In 2010 the National Strategy for the development of renewable energy for resources was approved in Lithuania. In November of 2011 passed a Law on Renewable Energy Resources defining the unified system favouring to utilize renewable energy resources.

Lithuania as well as other European Union countries encounter with problems of the shrinkage of fossil fuel resources, disastrous atmosphere contamination and climate change. Not having sufficient own priority energy resources, Lithuania's economy is dependent on the import of resources (gas from only one source) and thus is very exposed, particularly in case of disorders in supply or increased gas prices.

Therefore, because of expensive imported organic fuel, available, however so far insufficiently utilized, renewable energy resources can and has to give a larger input into the priority energy balance of Lithuania, therefore decreasing independence on fuel import and mitigating negative effects caused by increasing organic fuel prices.

Biomass, geothermal and solar energy is utilized for heating purposes in Lithuania. Firewood and wood waste, agricultural waste and biogas are main biogas resources. In 2008 such resources made 28 % in heating sector, of which 76 % made the energy from renewable energy resources directly utilized in the household. Only 15 % of central heating supply was generated from renewable energy resources. Therefore, the most promising development of renewable energy resources is linked to this sector.

In 2008, the electricity energy produced using renewable energy resources makes 4,6 % in total electricity energy consumption balance, of which 67 % of electricity energy generated by hydro plants, 22 % generated by wind power plants and 11 % generated by bio fuel plants.

In accordance with Directive 209/28/EC of the European Parlaiment and of the Council of the 23 April 2009 on the promotion of the use of energy from renewable energy resources, Lithuania has to ensure that in 2020 the energy from renewable sources makes no less than 23 % on the balance of gross consumption of energy (in 2008 it made only 25,3 %).

It is planned to allocate 69,5 million Euros from European Union Structural Funds for the development of renewable energy resources in Lithuania for the period 2007-2013. 15 projects received 41,6 million Euros funding. 17 projects related to the production of energy from renewable energy resources received subsidies from special State funding.

More than 1 milliard Euros is spent for annual import of energetic raw material. Experts in energetics state that renewable resources and energetic resources of more than of 40 mlrd. kWh of capacity could satisfy the annual deman on energy, of which is about 20 mlrd. kWh of heating and about 10 mlrd. kWh of electricity. The experts are suggesting to invest amounts to the local resources, and the development of the renewable energy to declare as a national key priority rather than the import of energetic resources.

- *Hydro energy*

Only one Hydroelectric Power Plant with total capacity of 100,8 MW and 85 smaller Hydroelectric Power Plants with total capacity of 26 MW are operating in Lithuania. In accordance with the legal acts of the Republic of Lithuania only the construction of small Hydroelectric Power Plants is permitted.

Managed by Lietuvos energija, AB Kaunas Hydroelectric Power Plant (the KHPP) is the largest power plant in Lithuania using renewable resources. Annual production currently meets 4 % of total energy consumed in Lithuania or over 40 % of total eneregy generated from renewable resources.

Managed by Lietuvos energija, AB Kaunas Hydroelectric Power Plant (the KHPP) is only one Power Plant of such type in the Baltic States. The total capacity is 900 MW (4 hydro units of 225 MW).

- *Wind energy*

It was stated for a long period of time that "there is no wind potential in Lithuania", however the comprehensive studies carried out in 1994 -1996 demonstrated that the overall wind power potential along the coastal areas of the Baltic States are similar to some of the best sites in Germany and Denmark, but the resource remains largely under-utilized. In 2003 the Baltic Wind Atlas has been developed.

Energy production from wind energy sources started from 2002, when the first wind turbine was installed. This was 160 kW second hand wind turbine from Denmark. In 2004 the first new wind turbine of 630 kW was installed in Vydmantai near Palanga pertaining to Kaišiadorys diocese. The first wind energy plant park was established nearby. Unfortunately 5,4 MW wind power plant owned by Danish company BNE was never connected to grid because of legal disputes.

The biggest wind power plant in Western Lithuania was installed in 2006, inbetween Palanga and Kretinga. Turbines of total capacity of 30 MW. begin_of_the_skype_highlighting

37 wind power plants are established in Lithuania. Turbines of total capacity of 70 MW, with total concumption of electricity energy of 2,5 %. It is planned till 2020 to raise the index uptill 10 %.

- *Solar energy*

In Lithuania annual average radiant solar energy is about 1000 kWh/m2 (in Europe the leading position in Southern Germany -1260 kWh/m2, in northern part is 970 kWh/m2, in Spain about 1500 kWh/m2). Thus, climatic conditions for solar energy in Lithuania are much poorer compared to Germany. Having evaluated energy solar energy resources in Lithuania, data sheets and maps of annual average radiant solar resources were developed.

Because of non available effective State support and because of incompetitive photoelectricity prices, the employment of such type of energy is very low in Lithuania (employed no more than 0,5 MW of capacities).

In July of 2011, AB „Lietuvos energija“ Kruonis Pumped storage hydroelectric plant started to employ the largest solar energy system in Lithuania. It is planned that the generator‘s capacity will be more than 70 MW.

Pharmaceutical company „Aconitum“ operating in Kaunas Free Economic Zone (**www.ftz.lt**) is the first pharmaceutical company in Eastern Europe, having renewable energy („green eneregy“) supply system installed: solar collectors, geothermal heating and conditioning systems. It allows the company to save up to 80 % of electricity energy and gas demand.

DATA ON LITHUANIA

Gross consumption of renewable energy, ktoe

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Firewood and wood waste	645,8	702,7	729,1	761,9	803,0	834,8	873,0	862,2	909,4	940,6	939,9
Agricultural waste	–	–	2,9	3,8	3,9	2,7	1,7	4,4	3,2	4,2	5,7
Biogas	–	–	1,5	1,9	1,6	1,8	2,0	2,5	3,0	4,7	10,0
Geothermal energy	–	–	9,5	3,0	2,9	2,9	1,7	1,5	0,6	5,1	4,5
Hydroenergy energy	29,2	28,0	30,4	28,3	36,2	38,8	34,2	36,2	34,6	36,5	46,4
Wind eneregy	–	–	–	–	0,1	0,2	1,2	9,1	11,3	13,5	19,3
Bio ethanol	–	–	–	–	0,1	0,8	5,4	11,8	15,7	14,4	12,2
Bio-ETBE (ethyl-tertio-butyl-ether)	–	–	–	–	–	–	3,6	6,7	7,7	0,1	–
Biodiesel - methyl (ethyl) ester	–	–	–	–	0,7	2,8	14,0	42,1	45,7	37,8	34,8

Electricity production from renewable energy sources, ktoe

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Hydro energy	29,2	28,0	30,4	28,3	36,2	38,8	34,2	36,2	34,6	36,5	46,4
Wind eneregy	–	–	–	–	0,1	0,2	1,2	9,1	11,3	13,5	19,3

Source: Lithuanian Department of Statistics, 2011

Job market

Favouring the development of „green energetics“, it is necessary to invest in improvement of competencies and qualifications of relevant specialists, to enhance cooperation between institutions carrying out fundamental and applied researches and business support organizations, and high schools. Kaunas university of technology provides studies for potential specialists of the highest qualification. Such specialists are employed in companies, which create, design and exploit renewable energy resources, and where engineers for maintainance of energetics objects, technological and science development are in demand. Lithuania is supplied by high qualification specialists and scientists in energetics field.

Kaunas university of technology is the only high education institution in Lithuania that started to provide BSc programme for undergraduate studies in the field of renewable energy engineering. It is a new programme of such type studies. This resulted from successful 60 years experience gained from provided studies programme in the field of eneregtics and of the demand in labour market to have spacialists with competencies in the renewable energy sector.

Lithuanian scientists establish companies were science and business meet and cooperate to ensure the application of advanced technologies in the production process. Joint venture company „Saulės energija" was established in 1991. The company‘s founders are scientists of Semiconductor Physics Institute. Photovoltaic modules have been produced since 1996 and being exported to Denmark, Sweden, Germany, Great Britain and the Netherlands.

In Lithuania till 2016 it is expected to create value added chain of solar energetics technologies ensuaring the export of 1,6 mlrd. litas value, about 500 labour places for specialists of high technologies and 2000 new labor palces exceptionally in photovoltaics business will be created.

The following goals are defined in the National Strategy for the Development of Renewable Energy Resources:

1. To increase renewable energy resources from 4,3 % in 2008 and till 10 % in 2020, compared to final energy consumption of transport sector in all types of transport.

2. To increase electricity energy generated from renewable energy resources from 4,9 % in 2008 and till 21 % in 2020, compared to the total state electricity energy consumption.

3. To increase renewable energy resources in heating and conditioning sector from 28 % in 2008 till 36 % in 2020, and to increase central heating supply generated from renewable energy resources from 14,9 % in 2008 till 50 % in 2020, compared to the final energy consumption in this sector.

In 2011 passed a Law on Renewable Energy Resources consolidated „market plus" model, what means that it is refused from fixed tarrifs in effect. It is expected to gain prices in electricity energy sector, to attract new investors and to promote the application of more effective technologies.

Managed by Lietuvos energija, AB Kaunas Hydroelectric Power Plant is preapring to utilize renewable energy resources - biofuel for electricity production. It is planned that already at the end of 2013, new devices for heating production will be exploited. Eventually, energy generated from renewable energy resources should substitute imported fuel.

It is planned in Kaunas to construct a biomass plant for heating purposes and lower heating prices. A new co - generation plant in 50 MW (megawatts) of heating energy and 25 MW electricity energy. It is planned that a new bioplant will start operating after the period 3 years. The total amount of the project is about 75 million Euros.

Eight places for construction of wind power plants are investigated in the Baltic Sea near Lithuanian coasts.

PV Technology Cluster consolidating 24 Lithuanian companies and research institutions is operating in Lithuania. In the forthcoming years it is planned to establish an experimental solar elements plant in Lithuania. A center of research on and production of solar energy technologies is established in Vizoriai Information Technology Park.

Total investments received from companies for the development of this center during the next three years will make about 150 million litas, the third of which will be funded by the European Union funds. A research laboratory for liquid glass used in production of solar units is situated in the periphery of Visaginas. Entrepreneurs from Šiauliai, in colaboration with foreign scientists, developed a unique technology for production of silicis (main raw material for production of solar units/cells).

Bibliography (sources):

- Ministry of Energy of the Republic of Lithuania, www.enmin.lt
- State Enterprise Energy Agency, www.avei.lt, www.ena.lt
- Lithuanian Energy Institute, www.lei.lt
- AB „Lietuvos energija“ , www.le.lt
- Lithuanian Department of Statistics, www.statgov.lt
- Lithuanian Association of the Bioenergetics and Energy Saving, www.energijaplius.lt
- Lithuanian Wind Energy Association, www.lwea.lt
- Lithuanian Solarenergetics Association
- Lithuanian Association of Photoelectricity Technologies and Business Association