Biomass EUVET 2012

"NEEDS AND CERTIFICATES OF THE ROMANIAN BIOMASS SECTOR"

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I. Brief introduction: General situation of renewable energy in Romania.

In the past decade, the main concerns and activities of national decision makers aimed at restructuring the Romanian economy, de-monopolization, privatization and the introduction of market economy mechanisms. At that time, renewable energy issues were less addressed.

Renewable energy became an important component of national energy policy at the beginning of the current decade, as the period of transition ended and Romania integrated in the EU. The signing of the Accession Treaty (April 2005) and achieving full EU membership (starting on January 1, 2007) were important moments in contemporary history of Romania. Adoption of the acquis communautaire on energy had a significant effect on renewable energy policy.

Romania was the first country in the Annex 1 of the United Nations Framework Convention on Climate Change which, by Law no. 3/2001, ratified the Kyoto Protocol, with the obligation to reduce emissions by 8% of greenhouse gas emissions compared to base year 1989 for the first commitment period 2008-2012.

Wider use of renewable energy sources (RES) is one of the directions of energy sector development for the 2015 horizon (the other two major directions is to reduce national energy intensity and dealing transactions with electrical energy that exceed the boundary of one or more countries).

Types of energy resources and renewable energy potential in Romania are summarized in Table 1:

Table 1. Renewable energy potential of Romania

Renewable energy resource	Annual energetic potential	Economic energy equivalent (thousands tons of oil equivalent -toe)	Use
Solar energy:			
- thermal	60x10^6 GJ	1.433,0	Heating
- photovoltaic	1.200 GWh	103,2	Electricity
Wind energy	23.000 GWh	1.978,0	Electricity
Water (hydro) energy:	40.000 GWh	3440,0	Electricity
under 10 MW	6.000 GWh	516,0	Electricity
Biomass	318x10^6 GJ	7.597,0	Heating
Geothermal Energy	7x10^6 GJ	167,0	Heating

Source: Energy Strategy of Romania for the period 2007 – 2020

Table 2 - Production forecast of electricity from renewable energy on the medium and long term

Renewable energy source	2010 (GWh)	2015 (GWh)
Solar energy	1,860	11,600
Wind energy	314	1.001
Hydro energy - total, Out of wich low power < 10 MW)	18.200 1.100	18.700 1.600
Biomass	1.134	3.654
Geothermal	-	-
Percentage of renewable electricity in the total national consumption	30,00%	30,40%

Source: Energy Strategy of Romania for the period 2007 – 2020

The objectives of the renewable energy strategy are:

- The integration of renewable energy in the national energy system structure;
- Reducing the technical barriers to functional and psychosocial use of renewable energy, simultaneously with the identification of real cost and economic efficiency;
- Promoting private investment and create the conditions to facilitate the access to foreign capital market for renewable energy;
- Ensuring the energetic independence of the national economy;
- Ensuring, where appropriate, the power supply to isolated communities using the potential of local renewable resources;
- Creating the conditions to participate in the European market of "green certificates" for renewable energy sources.

The main medium and long term options are oriented as follows:

- Transfer of unconventional technology from experienced companies and implementing rules, certifications and certification according to international standards;
- Developing and implementing the legal, institutional and organizational measures;
- Fostering private and public sector financing, management and the efficient operation of modern energy technologies;
- Identification of funding sources to support and develop applications to use renewable energy sources;
- Stimulating the establishment of joint-venture companies, specialized in using renewable energy sources;
- Development of research and development programs geared towards the acceleration and integration of renewable energy in national energy system.

Special attention will be given to rural energy, the issues addressed in detail using renewable energy resources.

In rural areas there are a variety of forms of renewable energy that can be used :

- Biomass is the main rural fuel, being used mostly for homes and water heating and cooking, (biomass covers about 7% of primary energy demand and 50% of renewable energy resource potential of Romania);

- Geothermal energy can be used for homes heating and water, depending on location, the main potential use is in rural areas - homes, greenhouses, aquaculture, pasteurization of milk - in locations at distances of up to 35 miles from extraction;
- Solar energy can be used especially for heating water, resulting in reduction of consumption of fossil fuels used;
- small hydropower can be a basic option for rural electricity power networks;
- wind generators can also cover the electricity needs of rural areas difficult to reach.

Fortunately, Romania can develop production systems of all types of renewable sources, according to the specific geographical areas of each country. Following country-wide studies, the potential in the production of green energy is 65% biomass, 17% wind energy, solar energy 12%, 4% small hydro power and 2% voltaic and geothermal.

According to studies drafted by the National Meteorology Administration, the energy potential of Romania is divided by geographical area, as follows:
- Danube Delta - solar energy;
- Dobrogea - solar and wind;
- Moldova - micro-hydro, wind, biomass;
- Carpathian Mountains - high-potential micro-hydro and biomass;
- Transylvania - potential for micro-hydro;
- Western Plains - possibilities of exploitation of geothermal energy;
- Sub-Carpathians hills - potential for biomass and micro-hydro;
- Romanian Plain - biomass, geothermal and solar energy.

Therefore, the development of renewable energy is a resource that can not be overlooked due to its economic and environmental importance and benefits. Currently, the interest of investors and users is concentrated mostly for small scale applications. Because the energy obtained from renewable sources is an alternative to fossil fuels, there is a growing demand for new renewable energy technologies, both for environmental reasons, and for other reasons such as:
- fast execution and entry into operation time (especially for photovoltaic and wind).
- good rate of return on investment due to relatively small investment and because the energy provided by these facilities is free.

- the number of villages/households not connected to the National Gridty is high, which require rapid, economically viable solutions.

Renewable energy can help meet priority needs of current electricity and heating needs in rural areas. In Romania there are many farms, villages, communities (located usually away from the mains supply and in inaccessible areas), which do not benefit from electricity.

II. Current status of the biomass sector. Employment opportunities

As per European Regulations, the following definitions are agreed nationwide in Romania:

- "biomass" means the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste;
- "biofuels" means liquid or gaseous fuel for transport produced from biomass;
- "biogas": a fuel gas produced from biomass and/or the biodegradable fraction of waste that can be purified to natural gas quality for use as biofuel or wood gas.

Briefly, in terms of biomass, the situation in Romania is as follows:

• Rural areas in Romania are well represented (about 40% of the population lives in rural areas). These areas are located close to biomass sources and therefore are suitable for decentralized heating systems. It is expected that 89% of the necessary heating homes and cooking food, in rural areas could provide energy only from vegetal waste.
• There is a traditional usage of biomass for energy (heating).
• There is a signifficant potential for forest and agricultural waste.
• There is a signifficant potential for agricultural biogas.
• There is a good working experience in the collection, storage and use of local biomass.
• We need a more efficient use of biomass for heating. Ensuring heating is a major social concern at local, regional and national.
• While other energy technologies already have a consolidated position on the market (hydropower, geothermal systems to produce heat), and are characterized by an irreversible development (biofuels, wind), modern technologies for heating and energy from biomass are still emerging in terms of market acceptance.
• Currently, the contribution of biomass is high, but by the predominant use of wood and agricultural waste in rural traditional stoves. The transition to a cleaner and more efficient technology to use biomass (as stipulated in Article No. RES Directive. 13.6) will result in a reduction in the biomass percentage use to final consumption. By 2020 though, a significant contribution of biomass use will remain for heating energy production in the rural stoves.

Biomass is for Romania, a renewable source of energy, promising both in terms of potential and, in terms of usability.

Data processing have raised the following profile maps:

• The energy potential of biomass in Romania comprises the geographical distribution (the counties and regions for economic development), of energy values (TJ) expected to be received by recovering energy from plant biomass;

• The distribution of vegetal biomass in Romania comprises the geographical distribution (the counties and regions for economic development) and the quantities (thousands cubic meters) of plant biomass.

The analysis of the geographical distribution of plant biomass resources potential energy available returns these regional data:

The richest counties in the forest are:

- Suceava 647,0 thousand cubic meters
- Harghita 206,5 thousand cubic meters
- Neamţ 175,0 thousand cubic meters
- Bacău 132,0 thousand cubic meters

The poorest in this type of resource are counties in the South:

- Constanţa 10,4 thousand cubic meters
- Teleorman 10,4 thousand cubic meters
- Galaţi 10,4 thousand cubic meters

The richest counties in agricultural resource are:

- Timiş 1432,0 thousand tons
- Călăraşi 934,0 thousand tons
- Brăila 917,0 thousand tons

The poorest in this type of resource are:

- Harghita 41,004 thousand tons
- Covasna 73,000 thousand tons
- Braşov 89,000 thousand tons

In terms of energy potential of biomass in Romania the country can be divided into eight regions, namely: Delta - biosphere reserve, Dobrogea, Moldova, the Carpathian Mountains

(Eastern, Southern, Western) Transylvanian Plateau, Western Plain; Sub-Carpathians, Southern Plain.

The potential of biomass types per region and the total is shown in the table below:

Nr.	Region	Forrest Biomass thousand tonnes/year TJ	Wood waste thousand tonnes/year TJ	Agricultural Biomass thousand tonnes/year TJ	Biogas ml.mc/an TJ	Urban Waste mii t/ an TJ	TOTAL
I	Danube Delta	-	-	-	-	-	
		-	-	-	-	-	
II	Dobrogea	54	19	844	71	182	29.897
		451	269	13.422	1.477	910	
III	Moldova	166	58	2.332	118	474	81.357
		1.728	802	37.071	2.462	2.370	
IV	Carpathian Mountains	1.873	583	1.101	59	328	65.415
		19.552	8.049	17.506	1.231	1.640	
V	Transylvanian Plateau	835	252	815	141	548	43.757
		8.721	3.482	12.956	2.954	2.740	
VI	Western plains	347	116	1.557	212	365	60.906
		3.622	1.603	24.761	4.432	1.825	
VII	Sub-Carpathian hills	1.248	388	2.569	177	1.314	110.198
		13.034	5.366	40.849	3.693	6.570	
VIII	Southern Plain	204	62	3.419	400	1.350	126.639
		2.133	861	54.370	8.371	6.750	
TOTAL		**4.727**	**1.478**	**12.637**	**1.178**	**4.561**	518.439
		49.241	**20.432**	**200.935**	**24.620**	**22.805**	

As shown in this table, technical energy potential of biomass is about 518,400 TJ.

The potential use of biomass for energy production in Romania is very high. For now, the use focuses mainly on households, so there are 14 million wood stoves or ovens for household

purposes (using wood, wood waste or other materials), 550 large industrial boilers for steam and hot water (wood), 10 water heating boilers (45 MW in total, 0.7 MW-7 MW), for heating (using wood waste).

In addition, Romania is trying to mobilize new resources for forest biomass: it is estimated that at least 3 million hectares of the agricultural land in the country (an area of approximately equivalent half of the forests) are affected by different stages of land degradation and becomes unsuitable for agricultural purposes under sustainable conditions. A large proportion of these will be afforested without requiring special land works and land improvement, and will be included in the productive forestry circuit. Afforestation brings important environmental benefits (quantified or quantifiable market) such as carbon storage, soil protection, water, biodiversity conservation.

There are also planned measures to encourage energy uses of unused arable land, degraded land, etc.:
- Measure 121 ("Modernisation of agricultural holdings") of the National Rural Development Programme 2007-2013 supports, among other things, the support for the establishment of crop species with short rotation (up to 5 years) and regeneration by vegetative means (shoots, etc.), crops such as poplars, energy willows, acacias, etc., to produce renewable energy.
- In terms of degraded agricultural land in the National Environmental Fund is included a "program for quality improvement of degraded environment through afforestation", but projects for reforestation of these lands do not include a specific exclusive energy destination.

Opportunities for employment from the renewable energy sector occur in a wide range of areas:

• Manufacturing - design and fabrication, component manufacture and supply, assembly, Refurbishment.

• Project development - a wide range of sectors contribute to the development of a RE project, including planners, surveyors, financiers, insurance, project design and developers, architects, etc.

• Construction and installation of the plant includes site operations, electrical and mechanical engineering, fabrications, etc.

• Operation and maintenance of the plant requires a range of specialist and non-specialist

skills, including management, servicing, fuel collection and supply (for biomass plant).

The development of biomass sector produces, especially on medium and long term, long-lasting positive effects and increases employment and quality of life, determined by the following:

- Market biomass tends to coagulate, by creating a platform for business development and initiation of various projects in the field. At this point, a National Association of Manufacturers of Biomass was established.
- The quality of life and number of jobs is increasing, especially in disadvantaged rural areas through the adoption of alternative energy solutions, increase of the attractiveness to the area;
- The increase of birth rates, reduce the brain drain phenomena, depopulation, decrease unemployment by attracting investors .
- The need of specialized equipment and specific biomass and biofuels technologies will increase both for energy generation and heat.
- Renewable energy is ecological, contributing to a sustainable environment and natural balance.
- Despite the economic crisis, investors are still interested in such projects, especially in the energy industry or infrastructure projects.

III. Professional profiles required in the biomass sector.

The legal regulations for qualifications required in the renewable energy sector, specify provisions for "heat pump installers and biomass and geothermal plants, solar thermal and solar photovoltaic." Law 220/2008 regarding the system to promote energy production from renewable energy sources, amended by Law no. 139/2010 establishes the following requirements:

- By 2012, responsible public authorities, under the coordination of the competent ministry, will prepare and make available to small boiler and biomass stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps installers certification schemes or an equivalent qualification system.

- Romania recognizes certifications awarded by any other Member States in accordance with the criteria set.

- central and local government authorities with responsibility for promoting renewable energy programs organize appropriate information, awareness, guidance or training on the benefits and practicalities of developing and using renewable energy.

Even if the law states that there has to be a certification of installers for boiler and small biomass stoves, the Nomenclature of Qualifications and in the Classification of Professional Occupations in Romania (COR-CPO) provides no explicit profession of installers that use the RES, but, for example the more general "central heating installer and gas "," electrician "etc.. In these conditions it appears that a system of permits for the exercise of the specific biomass installer activity/profession is not set up nor officially recognized. Activities of RES installations are performed by "generalists" installers. Actions have been initiated to fill-in specific professions in the COR RES recovery facilities.

The Body or bodies responsible/s for setting up by 2012 of the certification and of the system of authorization/qualification for installers of small boilers and stoves, biomass, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps has not been established yet.

The system of authorization of equivalent qualification schemes for installers provides, inter-alia, that installers are required to undergo prior training as a plumber for water and sewer

and/or electrician. These latter two qualifications are included in the qualifications listed in the Nomenclature, approved and updated periodically by order of the Minister of Labour and Minister of Education.

Authorization of electricians performing design/installation of electrical installations connected to the national energy system is made by the competent authority ANRE - National Energy Regulatory Authority.

Complementary to these systems is the certification system of technical experts and energy auditors for buildings and electrical and thermal. These courses are provided by the UTCB – Technical University of Civil Engineering Bucharest (postgraduate courses - 3 months) in building energy audit and certification comes from the Ministry of Regional Development and Tourism, according to the current legislation. Energy audit and certification courses are jointly performed by UPB - University Politehnica Bucharest, Faculty of Energy (power audit graduate courses, thermal and energy management) and ARCE - National Agency for Energy Conservation.

IV. Barriers to the development of biomass sector in Romania.

Romania's great potential in the biomass sector is often overshadowed by obstacles, given the Technological limitations, legal, economic efficiency and environmental restrictions. Below are stated some barriers, as they were made out of different strategies and studies in this field:

- There is a steady program of encouraging the use of arable land/degraded for energy crops but not enough incentives for producers of energy crops.
- improving the legal framework for forest management does not provide sufficient measures, to obtain more existing forest biomass.
- Campaigns to promote local and residential heating from biomass, such as information campaigns on the benefits and results are not sufficient or well-oriented towards the proper audience.
- The Qualifications and COR classification (Classification of Occupations in Romania) does not include specific qualifications for biomass sector, which makes difficult the development of qualification standards and training. This leads to an inability to develop training courses for installers in the field, although Law 220 provides for certification. There is no proper way to cover the steps required to achieve certification.
- Current legislation does not allow implementation of sustainability criteria for biofuels and biofuel.
- Research is not stimulated enough in order to achieve the necessary technology to achieve the objectives of the "20/20/20" programme. Little funds are available for developing energy from biomass, especially for updating biomass potential and identify specific conditions and technological aspects in Romania.
- Local authorities are not actively involved in addressing the new challenges of the energy field by increasing the quality of energy services in the areas of public lighting, transportation, air conditioning and heating supply and by promoting renewable energy in preserving the character of public utility service delivery. Biomass is a "local" fuel, so the involvement of local authorities, local businesses and local communities is crucial to find appropriate local solutions, including fuel collection.
- there is no support mechanism for local authorities so that they can turn district heating systems, on biomass as is the case for electricity from RES. A subsidy for investments in biomass heating systems and/or a regulated tariff differential for heating could exist and could

be introduced by the bodies responsible for regulation.

- Most biomass-based technologies are traditional, obsolete and are used only for heating.
- All three markets of the biomass sector (heating, electricity, biofuels) are characterized by poor organizing.
- In rural areas a problem consists in the small size of farms (average size is 2 ha), limited cooperation and lack of agricultural waste collection system.
- It seems that Green certificate quota system adopted by Romania is the best for the current position of the RES (other than hydropower), with very small funds raised. The solution used in Romania with green certificates (despite advantages) is not necessarily the best for creating more production capacity from renewable energy.
- Lack of funding or insufficient funding for the development of complex projects in the field.

V. Rules and regulations related to the sector of thermal applications of biomass: National and regional regulations and technical rules and standards about the facilities and installations.

According to Law 220/2008 regarding the system to promote energy production from renewable energy sources, amended by Law no. 139/2010 the following are stated:

- Competent Public authorities in granting permits, licenses or certificates for plants producing electricity for transmission and distribution networks for electricity or heating/cooling using renewable energy sources and transformation processes of biomass into biofuels or other energy products are required to issue the documentation that includes the specific procedures developed with the principle of proportionality and taking into account the specific structure of the renewable energy sector products.
- The regulations will have to be transparent, proportionate, not to discriminate between applicants and take into account the particularities of individual technologies using renewable energy sources.
- Simplified procedures are established for plants with installed capacity below 1 MW distributed generation facilities and renewable energy.
- Constructions regulations and building codes are to introduce measures to increase the share of all types of renewable energy.

The National Energy Regulatory Agency has the necessary powers, including the issuing of:

a) Authorizations for:

- Works to build electricity/power producing units and heat in cogeneration or/new generating capacities in such units, when installed electric power of that unit, that the ability/capacity to be set is greater than 1 MW;
- Refurbishment work units producing power/electricity and heat in cogeneration or one/some of the capacities of such units, when installed electric power of that unit, that the ability/capacity to be refurbished is greater than 1 MW;

b) Licenses for:

- the commercial operation of power generation capacity and heat in cogeneration;
- transmission services of electricity and system services;
- electricity distribution service.

In practice, because unnecessary obstacles or disproportionate requirements for authorization have been detected, steps have been taken to simplify certification and licensing procedures that are applied to plants and related infrastructure for transport and distribution network for electricity production, heating or cooling from renewable sources energy and the transformation of biomass into biofuels and other energy products.

- The number of authorization and licensing has been reduced, giving up the request for operating authorizations and permits operation for low power units.
- Requesting authorizations only for production capacities higher than 1 MW.

Licensing of establishment, for nationwide RES energy installations is with The Romanian National Energy Authority . Location of facilities/capacities of RES-E production, as an aspect of spatial planning, is authorized under the laws in construction and environmental protection, by the competent authorities at regional/local. Other mechanisms for coordination between these levels for approval are provided.
The European standardization bodies CEN/CENELEC and ETSI in ASRO (Standardization Association in Romania), has obliged Romania to adopt European standards as national standards.

In addition, through various financing co-financing schemes imposes criteria and standards (as eligibility rules) for investment projects in energy and heat. Thus, for example, through co-financing scheme without applying the State aid rules the following are supported:
- Local and intercommunity investment of development associations for construction and modernization of production capacities of electricity and heat by turning RES, in order to provide a public service (for heating) or consumption (including street lighting and institutions public). Only projects that provide for making initial investments can be financed through the scheme. Projects that are, in fact, simple replacement investment or rehabilitation of existing fixed assets are not accepted. All projects (regardless of technology used) must have demonstrate economic efficiency by means of feasibility studies. No specific objectives of certain technologies are provided. Some technologies (combustion processes, cogeneration, biofuel production) must meet certain conditions for those projects to be eligible. CHP projects can be funded only if aimed at high efficiency cogeneration. For other projects, support is not explicitly conditioned on meeting energy efficiency criteria, but may be granted only for the realization of new plants that are supposed to be more energy efficient.

In terms of facilities and installations for increased use of biomass, studies that were the basis for Romania Biomass Master Plan recommended the following technologies as having good efficiency in Romania - (local heating and cogeneration systems) using:

- waste wood and straw
- biogas resulting from anaerobic digestion of organic waste streams.

These technologies require special attention, because together with biofuels and wind, they are the main new source of renewable energy in Romania. Currently, there is little biomass boilers for central and local heating plants with cogeneration.

These developments of using biomass and equipment are expected for the period 2010-2020:

Evolution 2010-2020		Comments
Replacing traditional biomass stoves with natural gas-based heating	2% of stoves	Only for the next 2-3 years, while natural gas will be of interest
The transition from traditional biomass stoves in local systems fueled with biomass centralized	Approx. 29% of all stoves	
Replacing traditional biomass stoves with efficient biomass boilers in homes	18% of stoves	Replacement rate is 1,5% per year
Consumption of biomass for the remaining traditional biomass stoves left - approx. 66 PJ/year		
Modernization of existing industrial boilers	The average increase efficiency of existing boilers to 15%	
Consumption of biomass in existing industrial boilers - approx. 16 PJ/year		
Total	82 PJ/year	

In terms of technologies (facilities and equipment) for producing energy from biomass until 2012, including biofuels for transport, the Master Plan provides the following scenarios:

Technology	2020	
	Kt oil eq.	D Quota
Stoves/boilers solid biomass	1966	41,8%
Local centralized heating of solid biomass	669	14,2%
Electricity from cogeneration units using solid biomass	344	7,3%
Heat from cogeneration units using solid biomass	413	8,8%
Electricity from biomass by burning mixed	41	0,9%
Heat from biomass by burning mixed fuel combined	12	0,3%
Electricity from cogeneration groups based biogas	155	3,3%
Heat from biogas	217	4,6%
Electricity from cogeneration groups based on municipal waste	30	0,6%
Heat from municipal waste	100	2,1%
biofuels	754	16,0%

VI. Level of qualification required by the regulations.

Legislation asks for certification and licensing of installers for small boilers and biomass stoves. The Nomenclature of Qualifications, generalist qualified installers are required to have Level 2 of qualification (specifically: "The work is performed under supervision with some degree of autonomy"), according to the European Qualifications Framework (EQF). By extrapolation, also for installers of small boilers and stoves from biomass, in the moment of classification, will be provided for level 2 qualification.

The following measures are described:
MECMA - Ministry of Economy, Trade and Business Environment will ask the Ministry of Labor the inclusion in the COR (Occupations Classification in Romania) to include in the norms the qualifications for the 3 categories of installers provided by law (for heat pump installers and biomass, geothermal installations and installers for installers for solar thermal systems and solar photovoltaic). It may require a qualification aggregate (for all the 3 categories of installers) or for each one of the 3 categories of installers.

In parallel, an occupational standard should be designed. In this respect, professional associations in the renewables with MECMA will notify the National Authority for Qualifications (NAC) on the intention to develop a standard/occupational standards in the field. After notification, professional associations in the field of renewable energies with MECMA will develop a draft occupational standard that will be approved by the relevant sectoral committee of the NAC. After validation by standard committees, it is approved by the NAC and training providers may require NAC recognition/approval of courses.

VII. Required professional licenses related to the rules.

Certification and qualification systems take into account the following guidelines:

I. Accredited training programs should be offered to installers with experience at work, who have undergone or are still undergoing these types of training:
a) for boiler and biomass furnaces: prior training as water and sewerage plumber, pipe fitter, plumber heating engineer or technician of sanitary and heating or cooling;
b) for heat pump installers: prior training as water and sewerage installer or fitter holding refrigerator and basic electrical skills and installer of water and sewerage (cutting pipe, soldering pipe joints, gluing joints pipe insulation, sealing fittings, testing for leaks and installation of heating or cooling);
c) for installer of solar thermal or photovoltaic solar facilities: prior training as water and sewerage plumber or electrician, holding basic qualifications for water and sewerage plumber, electrician and qualified for work in construction application of coatings, including knowledge of soldering pipe joints, gluing pipe joints, insulation, sealing fittings, testing for leaks in water and sewerage works, ability to connect wiring, familiar with basic roof materials, methods as and arc welding, or
d) a training program to provide an installer skills corresponding to three years of training in the skills referred to the letter. a), b) or c), including both classroom and workplace.

II. The theoretical part for the stove and boiler installer training should give biomass an overview of the market situation and cover ecological aspects, biomass fuels, logistics, fire protection, related equipment, combustion techniques, firing systems , optimal hydraulic solutions, cost and profitability comparison as well as design, installation and maintenance of biomass boilers and stoves.

Training should also ensure good knowledge of European standards for technology and biomass fuels, such as pellets, as well as national and Community legislation on biomass.

III. The theoretical heat pump installer training should give an overview of the market situation for heat pumps and cover geothermal resources and ground source temperatures of

different regions, identifying thermal conductivity of soils and rocks, regulations on using geothermal resources technology feasibility of using heat pumps in buildings and determining the most suitable heat pump system and knowledge of technical requirements, safety, air filtering, connection to the heat source and system layout. Training should also ensure good knowledge of European standards for heat pumps and relevant national and Community legislation. The installer should demonstrate the following core competencies:

a) basic understanding of physical principles of heat pump operation, including heat pump characteristics: context between low temperatures of the heat sink, high temperatures of the heat source and efficiency, determine the coefficient of performance (COP) and seasonal performance factor (SPF);
b) understand the components and their function within a heat pump, such as compressor, valve, evaporator, condenser, fixtures and fittings, lubricating oil, refrigerant, superheating and sub-cooling and cooling possibilities with heat pumps;
c) the ability to choose and size the components in typical installation situations, including determining the typical values of the heat load of different buildings and for hot water production based on energy consumption to determine heat pump capacity on the heat for hot water production, the storage mass of the building and on interruptible current supply, determine buffer tank component and its volume and integration of a second heating system.

IV. The theoretical part of training solar thermal installer of solar photovoltaic and should provide an overview of the market situation of solar products and comparisons of cost and profitability and cover ecological aspects, components, characteristics and sizing systems the uses of solar energy, selection of accurate systems and dimensioning of components, determination of the heat, fire protection, related equipment and design, installation and maintenance of solar photovoltaic and solar. Training should also ensure knowledge of European standards and certification technology, such as Solar Keymark, and related national and Community legislation. The installer should demonstrate the following core competencies:

a) ability to work safely, using equipment and tools and implementing codes and standards and ability to identify the hazards of electricity works, electrical and other hazards and associated facilities solar;

b) ability to identify systems and components specific to active and passive systems, including their mechanical design, and determine the location of components, system layout and configuration;

c) ability to determine the required installation areas, orientation and inclination of solar water heater and solar photovoltaic, taking account of shading, solar access, structural integrity, installation opportunity in terms of building or the climate and identify different installation methods suitable for roof types and extent of necessary equipment for installation in the system

d) in particular for solar photovoltaic systems to be able to adapt the electrical design, including determining design currents, selecting appropriate conductor types and corresponding ratings for each electrical circuit, determining appropriate size, ratings and locations for equipment and subsystems and selecting an appropriate interconnection point.

V. Installer certification should be limited in time, so it is recommended that a seminar or training course to ensure continued learning and certification.

VIII. Bibliography

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3. The National Strategy for Renewable Energy Sources Capitalization;

4. The National Strategy for Energy Efficiency;

5. Biomass Action Plan;

6. Biomass Master Plan for Romania;

7. Analysis of the main resources and opportunities available for short and medium-term production of energy, within the project "Renewable Energy Resources - a solution for sustainable development of two European regions", developed by RenERg and EuReg;

8. The Law 220/2008 regarding the system to promote energy production from renewable energy sources.