

# THE RENEWABLE ENERGY SOURCES IN ROMANIA – OPPORTUNITIES FOR DEVELOPING THE NEW SKILLS FOR LABOUR MARKET

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**Abstract:** *The renewable energy represents the energy produced from a wide variety of resources, having the ability to renew. This paper consists into a scientific approach of the potential of the renewable energy sources in Romania and analyzes the occupational and skill needs in domain of renewable energy. The authors assessed in this study, the main skills and competences of the energy recovery technology from renewable sources.*

**Keywords:** *renewable energy sources, energetic potential, Qualification Framework.*

## 1. RENEWABLE ENERGY SOURCES – GENERAL ELEMENTS

Humanity faces this century with some major problems such as those of energy, water and food, the essence present-day concerns being the shaping of viable solutions aimed at a sustainable development (Omer, 2008; Campbell, 1996). In this context there is a need to allow access to the energy of billions of people who are currently deprived of it. In recent years research scientists have become increasingly unanimous in assessing that a strong increase in global emissions of greenhouse gases will lead to a warming of the Earth's atmosphere by 2-6°C, by the end of this century, with disastrous effects (Bowen and Ranger, 2012). Conventional energy sources prove their limits every year. On one hand, conventional oil and natural gas, according to many of the specialized international committee reports will be available for approximately 40 years. Taking into account the resources that will be discovered in the following years, the experts estimated that by 2020, the production of oil and gas will increase, the price of oil being maintained within reasonable boundaries, the production thereafter will fall and the price shall increase towards 2040-2050. Unconventional oil resources (oil shale and tar sands), shall represent additional resources at higher costs and higher CO<sub>2</sub> emissions. On the other hand, the use of energy from fossil fuels (oil, gas, coal) by combustion has had disastrous effects on the environment, greater than any human activity in history: the accumulation of harmful gases into the atmosphere, which triggered proces-

ses (perhaps irreversible) such as ozone depletion, global warming etc.

Therefore, the use of alternative energy sources becomes increasingly important, ever necessary for today's world (Bert J.M. de Vries et.al, 2007). These sources, namely the sun, the wind, geothermal energy, etc. are practically not consumed and are also known as renewable energy sources, alternative or unconventional.

This work paper is a scientific study about the potential of the renewable energy sources on the Romanian area. This paper presents a realistic analysis of the technical-economical and ecological efficiency on the use of alternative energy sources and of the interesting perspectives regarding their use (Nicolae et.al. 2012). In this context the paper presents a synthesis of the main qualifications imposed by the European labor market in the field of renewable energy.

## 2. ENERGY SOURCES - CONVERSIONS AND USE

A review of primary energy sources reveals the following categories: fusion and nuclear fission, solar radiation, chemical reactions such as burning fossil fuels or biomass, gravitational forces, the movement of planets, friction. In terms of place of origin, Figure 1 shows that energy can be "purchased" from the following sources: *land (soil)*: conventional fossil fuels (coal, oil, gas), unconventional fossil fuels (tarred sand, bitumen oil), nuclear fission - uranium, hydropower, geothermal energy; *ocean*: tidal energy, wave energy; *solar*: solar

thermal, photovoltaic, wind, biomass. Renewable energy is mainly based on the great nuclear fusion reactor which is the Sun; tidal power is based on the kinetic energy of the moon, which generates tidal gravity, geothermal energy is based on the hot core of the Earth, left after its creation. All renewable energies produce far fewer emissions, reduce chemical pollution, thermal radiation and are available virtually anywhere in the world.

The rapid depletion of the reserves of fossil fuels, their use being accompanied by environmental pollution (including so-called “dirty” heat, and the alarming increase in the level of carbon dioxide in the atmosphere), the limited resources of uranium (through its use in energy, resulting in radioactive

waste) as well as the uncertainty of life and the ecological consequences of industrial use of thermonuclear energy urge researchers, scientists and engineers to pay more attention to the search of new opportunities for profitable, alternative, unlimited and clean energy sources. Using renewable energy sources (RES) has the advantage of their durability and negligible impact on the environment, given the fact that they do not emit greenhouse gases. Even if by burning, biomass eliminates an amount of CO<sub>2</sub> that is absorbed during the conversion process, the balance is zero.

At the same time, these technologies do not produce hazardous waste, and their removal at the end of use, unlike nuclear plants, is relatively simple.

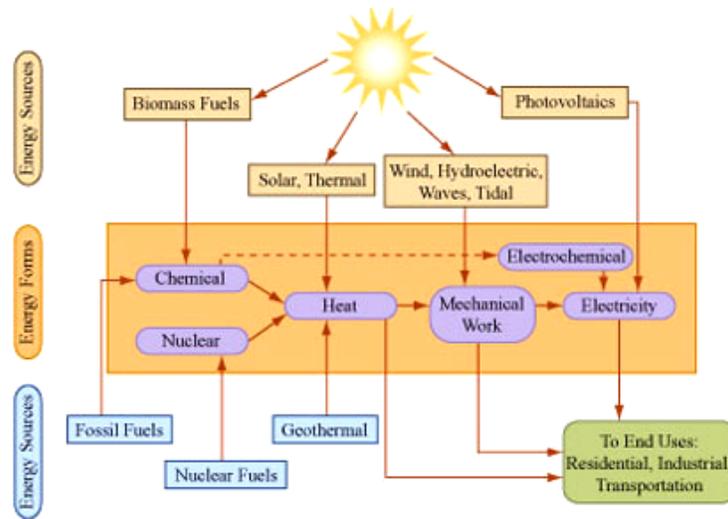


Fig. 1. Energy sources, conversions and use (<http://labspace.open.ac.uk>)

### 3. POTENTIAL OF THE RENEWABLE ENERGY RESOURCES IN ROMANIA

Romania has significant reserves energy sources. The share of electricity produced from renewable energy resources in the national gross electricity consumption was about 19,650 GWh in 2010. While the EU target for 2020 is to achieve 20% of the total Community energy consumption from RES, Romania sets out an even more ambitious goal up to 38% as share of electricity produced from renewable energy resources in the national gross electricity consumption till 2015 (NREAP-RO, 2010). In this perspective, Romania has to intensify its efforts to use and implement renewable energy resources and technologies. The renewable energy resources will be used both in the sector of electricity production and in the heating sector; in the latter both building of new power plants for

high efficiency cogeneration (especially based on biomass use) and building of new power plants based on solar and geothermal energy are envisaged, thus leading to an increase of RES-based heat production. Romania’s potential in wind energy is considered to be the highest in South Eastern Europe. The Moldova and Dobrogea regions (in the southeast of the country, near the Black Sea) were considered the most appropriate areas for wind farm developments. (Miron, D., Preda, M., 2009).

Solar energy shows a moderate potential throughout the entire territory of the country, but the most abundant solar resources are located in the southern part of the country and Dobrogea. Considering solely the solar electricity potential, its potential is approximately 1.2 TWh, (E.C. JRC). Estimation of total contribution (installed capacity, gross electricity generation) expected from each

renewable energy technology in Romania to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity, Table 1 and heating and cooling, Table 2.

#### 4. RENEWABLE ENERGY TECHNOLOGIES - CORE OCCUPATIONS AND SKILLS

Achieving a successful transition to the low-carbon economy is one of the greatest policy challenges of facing governments and their people's needs worldwide, corresponsive concerning to businesses, workers and the organizations that represent them.

More renewable capacity is being deployed rapidly. Almost half of the new electricity-generating capacity deployed globally in 2008 and 2009 was based on renewable energy technologies (IEA,

2010; EREC, 2008). Experience of recent year's shows that deployment of all the main technologies is growing strongly. Despite ongoing technological improvements cutting the cost of producing renewable energy and opening up more renewable resources to exploitation, public policy still plays an important role in driving the deployment of renewable energy capacity, and will continue to do so. Employment in renewable energy is not just located in the energy-producing sector. The renewable energy value chain encompasses: manufacture and distribution of renewable energy equipment, renewable energy project development, construction and installation assessments associated with the development of renewable energy capacity, operation and maintenance of renewable energy facilities, and a range of cross-cutting activities that contribute to more than one of the other value chain stages.

Table 1

Contribution of RET to electricity consumption for Romania (NREAP-RO, 2010)

	2005		Average 2011-2012		Average 2013-2014		Average 2015-2016		Average 2017-2018		2020	
	MW	MW	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Biomass	0	0	130	615	295	1420	468	2250	553	2650	600	2900
Hydro	6289	16091	6612	17036	6972	17909	7337	17792	7483	19140	7729	19768
Photovoltaic	0	0	26	30	96	120	166	200	210	259	260	320
Wind	1.32	0.227	1550	2656	2665	5293	3300	5943	3675	7844	4000	8400
Total RES	6291	16092	8315	20338	9890	24741	11270	28194	11920	29901	12589	31388
RES-E*	30.08		32.3		38.35		42.1		42.6		42.62	

\* share in the gross final electrical energy consumption

Table 2

Contribution of RET to the heating and cooling consumption for Romania (ktoe) (NREAP-RO, 2010)

	2005	Average 2011-2012	Average 2013-2014	Average 2015-2016	Average 2017-2018	2020
	Biomass	3166	2882	2893	2954	3203
Solar thermal	0	2	8	16.5	30	70
Geothermal	17	32.5	44	54.5	66	80
Heat pumps	0	1	2.5	4	7	12
Total RES*	3183	2917	2947	3029	3305	4038
Gross heat.	18779	16300	17010	17609	17890	18316
RES-E**	16.94	17.89	17.32	17.2	18.47	22.04

\* RES heating and cooling energy, total

\*\* share in gross final heating and cooling consumption

Serious deficits in qualified professionals, in management and technical, job-specific skills are hampering Europe's sustainable growth objectives in RES domain (ILO, 2011). This is also the case for shortages in areas critical for innovation, in particular technology for the RES. In the marine renewable energy sector, for example, demand for offshore investment in sustainable energy already requires many skills, other than those

which workers in those sectors currently have. Indeed, significant investments in "green" skills need to be made to ensure Europe lives up to its ambition of having hundreds of thousands green collar workers in renewable energy by 2020 (REN 21, 2009). An important contribution of this paper is shown in Table 3. The table summarizes the core skills for the renewable energy sectors (Nicolae et.al. 2012b).

Table 3

**Skills for Renewable Energy Sources (RES)**

Equipment Manufacture & Distribution	Project Development	Construction and Installation	Operation and Maintenance	Biomass production	Cross-Cutting Occupations
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Another important contribution of this paper will be linked to the identification of the core occupations in each part of the renewable energy value chain, for each technology, along with a description of the contributions they make. The table below shows an extraction from the main table for illustrative purposes, listing the main occupations associated with each stage of the value chain, but only for one technology under each value chain stage. Most of the occupations involved already exist, but require some new skills and knowledge, Table 4 (ILO, 2011).

**5. CONCLUSIONS**

Through a coherent energy development strategy in Romania can be provided an increased safety in the energy supply together with energy resources import limitations, in terms of accelerated economic development. This requirement can be achieved by implementing a sustainable policy of energy conservation, increasing energy efficiency in order to lead toward decoupling the economic development

rate from the energy consumption development, while increasing the value of renewable energy. The recovery of the renewable energy sources potential offers real prerequisites for achieving some strategic goals regarding the increasing of the security in energy supply by diversifying the sources and reducing the share of energy resources imports, the sustainable development of energy sector and environmental protection. Renewable energy sources can contribute to the gratification of current needs of heating in certain underprivileged (rural) areas. The measures considered for promoting the renewable energy sources are: the increase of usage level, within economic efficiency, of renewable energy sources for the production of electricity and thermal energy by granting facilities during the investment stage, including facilitating access to the electric grid; promotion of certain support mechanisms of renewable energy resources for the production of thermal energy and domestic hot water; use of structural funds.

Table 4

**Skill levels of occupations for Renewable Energy Tehnologies**

RES type	Skill levels of occupations	High skilled: Professional/Managerial	Medium skilled: Technician/Skilled crafts/ Supervisory	Low skilled: Semi-skilled & unskilled
Wind Energy	Equipment Manufacture & Distribution	R&D engineers (computer, electrical, environmental, mechanical, wind power design); Software engineers; Modelers (prototype testing); Manufacturing engineers; Manufacturing quality assurance experts; Certifiers; Logistics professionals; Procurement professionals; Marketing specialists; Sales personnel	Industrial mechanics; Software engineers; Modelers (prototype testing); Manufacturing technicians; Manufacturing quality assurance experts; Logistics professionals; Procurement professionals; Marketing specialists; Sales personnel	Manufacturing operators Logistics operators Equipment transporters
Solar Energy	Project Development	Project designers (engineers); Architects (small projects) Atmospheric scientists and meteorologists; Resource assessment specialists and site evaluators; Environmental consultant; Lawyers; Debit financier representatives; Developers/facilitators; Land development advisor; Land use negotiator; Lobbyist ; Mediator Environmental and social NGO representatives; Public relations officer; Procurement professionals; Resource assessment specialists	Developers/facilitators; Environmental and social NGO representatives; Procurement professionals	-

Table 4 (continued)

RES type	Skill levels of occupations	High skilled: Professional/Managerial	Medium skilled: Technician/Skilled crafts/ Supervisory	Low skilled: Semi-skilled & unskilled
Geothermal Energy	Operation and Maintenance	Plant managers; Measurement and control engineers Plant managers (H)	Welders; Pipe fitters; Plumbers; Machinists; Electricians; Construction equipment operator; HVAC technicians	-
Bioenergy	Biomass Production	Agricultural scientists; Biomass production managers; Plant breeders and foresters	Biomass production managers; Plant breeders and foresters	Agricultural/forestry workers Transportation workers
From Solar	Cross-Cutting Occupations	Policy-makers and government office workers; Trade association and professional society staff; Educators and trainers; Management & Administration; Publishers and science writers; Insurer representatives; IT professionals; Human resources professionals; Other financial professionals; (Accountants, auditors and financiers); Health and safety consultants Clients	Policy-makers and government office workers; Trade association and professional society staff; Management & Administration; Publishers and science writers; Insurer representatives; IT professionals	Trade association and professional society staff Management & Administration

Pacing investment in renewable energy to smooth employment over time can bring benefits to renewable energy businesses and employees by preventing booms and busts in demand for skills. In this regard smaller renewable energy projects require skilled crafts workers with sufficient breadth of skills to be able to do the work by themselves, or at least to cooperate effectively with others. There is a need for effective skills anticipation in renewable energy, and there is a particular need for Romania to plan to maximize the local employment benefits from renewable energy projects. Initiatives to develop skills for renewable energy should aim to develop skills that are sufficiently portable so that can be applied to new renewable energy technologies and outside the renewable energy sector.

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