New businesses for small and medium entrepreneurs (SMEs) in the Renewable Energy Sources (RES)

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Abstract: The development of renewable energy producers in rural areas creates new job opportunities for the countryside population. The decentralized manner of renewable energy in small cities is one of the ways how to meet the rural and small scale energy needs in a reliable, affordable and environmentally sustainable way. In 2010, the Czech University of Life Sciences Prague has finished the participation in the European IEE project RES COMPASS. In mutual cooperation, with seven partners from the Great Britain, France, Spain, Greek and Finland, the University has been involved in the extensive research concerning the impact of the Renewable Energy Sources (RES) on the future European labour market. The RES COMPASS project meets the objectives expressed by the New Skills for New Jobs Initiative of the EU and stressed also other initiatives, namely the Green Jobs Initiative, the UNEP initiative as well as the requirements of the International Trade Union Confederation and the International Organization of Employers in 2008. The RES COMPASS programme strategy was based on the implementation steps in three mutually supportive components: The first component Comparative analysis of the methods of identification of skill needs on the future labour market based on the renewable energy sources was concerned in the young generation of the today's students. The second component Career Orientation test was developed as a tool for the potential young people thinking about a future career in the emerging area of renewable energy. The third component focused on the future business opportunities for small and medium entrepreneurs (SMEs) in the RES sector. The paper informs about findings of the third component New businesses for SMEs in the RES. Realistic possibilities of the development of SMEs appear to exist in the provision of more complex services reacting to (1) needs of more rapid renovation of the morally depreciated devices, (2) interest of inhabitants and producers in the installations of at least two different autonomous alternative energy sources, (3) creation of informal groups of users who will share various energy sources, (4) need to support the installation of energy devices with other measures – energy audits and projects.

Key words: renewable energy sources (RES), market job opportunities, small and medium entrepreneurs (SMEs), questioning, managed interview, shared RES

The energy demand has grown strongly and it will continue to increase. According to the International Energy Agency (IEA 2006a, b) estimates, the world energy demand will increase by half again between the present and 2030. At the present time, the primary energy sources are dominated by the fossil fuels, with nearly 80% of the global energy demand supplied from crude oil, natural gas, and coal (Rathore and Panwar 2007).

Renewable energy sources (RES) which can be used to produce energy again and again will make it possible to resolve the presently most crucial tasks:
– improving the energy supply reliability
– solving the problems of local energy and water supply
– increasing the standard of living
– increasing the level of employment of the local population
– ensuring sustainable development.

Renewable energies are of major importance to all EU countries. They create a significant employment in education, R&D, consultancy, engineering, agriculture, finance and government. The sector net employment growth is expected to be 1 660 000 by 2010 with the total of 2 463 000 new jobs by 2020. The current and future shortage of a skilled personnel in the renewable energy-related occupations is a major obstacle to the success of the RES development (Valkila and Saari 2010). The Ministry of Education, Youth and Sports of the Czech Republic declares that there is a lack of 40 000 of higher skilled personnel for the RES sector for the near future, so that the Czech Republic could be competitive in the European space.

European countries have been in the forefront and a number of studies suggest a substantial job potential. A modelling exercise supported by the EU found that under the current policies, there could be a net gain

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of 950.000 direct and indirect full-time equivalent (FTE) jobs by 2010 and 1.4 million by 2020. Under the "Advanced Renewable Strategy" there could be 1.7 million net jobs by 2010 and 2.5 million by 2020 (EC 2003a, b). About 60–70% of the jobs would be in the renewables industries (primarily biofuels and biomass processing and wind power), the remainder in agriculture (WWF 2009; Kirtay 2011). Similarly, the European Renewable Energy Council (EREC) argues that by raising the share of renewable energy to 20% of the EU's energy consumption by 2020, the number of green jobs could rise to more than 2 million (Balachandra et al. 2010).

When it comes to energy efficiency, a comprehensive study by the Association for the Conservation of Energy in the UK found that per € 1 million of the total expenditure (both government and private), the energy efficiency programmes typically resulted in 8 to 14 additional person- years of employment (Jacobson and Delucchi 2010).

The development of renewable energy producers in rural areas creates new job opportunities and minimizes the migration towards urban areas (Panwara et al. 2011). The decentralized manner of renewable energy in small cities is one of the ways how to meet the rural and small scale energy needs in a reliable, affordable and environmentally sustainable way (IEA 2006a).

In 2010, the Czech University of Life Sciences Prague has finished the participation in the international IEA project RES COMPASS. In mutual cooperation, with partners form the Great Britain, France, Spain, Greek, and Finland, the University has been involved in the extensive research concerning the impact of renewable sources of energy (RES) on the future European labour market. Aspecial attention was paid to the cooperation and knowledge sharing among all involved partners in the field of early identification of the entrepreneurs´ skills needed for successful entry into the future RES markets. The project enhanced understanding of the European labour market, social, economic and environmental issues, the design of the policies, programmes and tools in the RES field of the entrepreneur's skills identification.

The RES COMPASS project meets the objectives expressed by the New Skills for New Jobs Initiative of the EU and stressed also other initiatives, namely the Green Jobs Initiative, the UNEP initiative as well as the requirements of the International Trade Union Confederation and the International Organization of Employers in 2008.

Countries around the world face unparalleled challenges of changing situations in the labour market. Skills shortages and skill gaps damage the productivity and competitiveness and eventually have a number of adverse economic effects at all levels: individual, company, regional, and national. It is essential that the potential skills mismatches, both in the terms of skill shortages and skill gaps, are timely identified and that the relevant skills response strategies are ensured to mitigate the costs of economic restructuring.

Governments and social partners are looking both for efficient exit strategies from the economic downturn as well as for longer term strategies to achieve the sustainable development pathways. Skills responding strategies must go hand in hand with other measures, both short- and long-term, to ensure the availability of skills. The shortage of the green-collar professionals with the cutting-edge skills in energy efficiency, green engineering and green construction has already been identified in a number of countries as a major obstacle in implementing both the current green stimulus packages and the longer-term national strategies to cut the gas emissions.

The RES COMPASS programme strategy was based on the implementation steps in three mutually supportive components:

The first component Comparative analysis of methods of the identification of skill needs in the future labour market based on the RES was concerned with the young generation of the today's students. The final report has concluded the analysis with a number of recommendations on the quantitative and qualitative methods and institutional mechanisms for the labour market assessment and signalling adjusted to different needs and levels of education.

The second component Career Orientation test was developed as a tool for the potential young people thinking about a future career in the emerging area of renewable energy. The RES Compass career decision tool consists of a series of questions designed to identify which of the four Renewable Energy Sectors are most suited to the interests and skills of the potential young employee. The four sectors are: (1) Technicians (Manufacturing & Construction and Operation & Maintenance, (2) Technical Design Consultants & Researchers (Technical Consultancy/ Design and R&D/ Engineering), (3) Energy & Regulation Advisors & Trainers (Policy/Planning advice and Energy management & advice/training, (4) Business Development Executives (Business development & sales and marketing & media). Within each of the four career sectors, the student discovers various types of the careers available. Information is given on each career in the form of a job profile which gives details on the job and the tasks a person would perform, as well as the skills and the training required to get started. The test is freely available for all interested persons on http://www.rescompass.org.

The third component focused on the future business opportunities for small and medium entrepreneurs (SMEs) in the RES sector. The study New businesses for SMEs in the RES helps to shed light on the global dimension of the developing RES sector which is expected to influence the competitive market in this green sector of economic behaviour.

The purpose of the paper is to inform about the findings of the third component of the RES COMPASS project New businesses for SMEs in the RES.

OBJECTIVES AND METHODS

Renewable energy sources (RES) provide a wide range of opportunities for entrepreneurs across all levels of manufacturing and services. All expert studies agree that this area is not only going to preserve its exclusive position within the market, but that it will simultaneously expand its potential. Big entrepreneurs are not expected to encounter difficulties upon entering the continuously changing entrepreneurial environment of the RES – they may make use of the available research and educational capacities which allows them to adapt themselves easily to the changing requirements and new opportunities. However, both small and medium-sized entrepreneurs lack sufficient information and the subsequent delay in terms of assuming new technological and managerial proceedings may result in their decreased ability to operate within the competitive environment in the area of the RES.

The third component of the RES COMPASS project was therefore aimed at ensuring a large scale research monitoring the degree of awareness and the strategic thinking ability concerning the prospective development and market opportunities in the area of RES with small and medium-sized entrepreneurs.

The EU norm (Commission Recommendation 2003/361/EC) advises to qualify enterprises within the category of "Small and medium-sized enterprises" if the number of employees is less than 150. The research focused on "small" enterprises, i.e. those employing 50 employees at the most and with the annual turnover not exceeding € 10 million.

The research was carried out in 7 European partnership states; the Czech Republic, the Great Britain, France, Spain, Greece and Finland for the period October–November 2009.

The research was realized by the means of questionnaires. Questions were divided into two categories. The first set of questions was common for all participant states and it served as a basis for the comparison and analysis of the research results within the group of the chosen European states. With the second category of questions, it was up to the partners involved in the project to choose the appropriate questions depending upon the specific conditions of the given country and its particular needs. The Czech partner, i.e. the Czech University of Life Sciences Prague, selected the set of questions related to the needs of a further education (Havlíček et al. 2006).

The document, which served as the basis for all project participants coming from the already mentioned seven European, states was the above mentioned Comparative analysis of methods of identification of skill needs on the future labour market based on the RES. This study was simultaneously elaborated in the form of an information brochure that was sent to all addressed small entrepreneurs from the target group prior to the research initiation.

The research predicative value depends on the number of properly filled in questionnaires. It was therefore necessary to ensure that each participant state had at least 20 selectively chosen enterprises from the defined target group available for the final elaboration. Considering the expected 20% response rate (number of returned questionnaires), it was thus indispensable to address about 100 entrepreneurs in each of the participant states.

Research in the Czech Republic

The third component focusing on the prospective business opportunities for SMEs in the RES sector in the Czech Republic was highly important for the Czech University of Life Sciences, Prague. The area of RES is closely linked with both the content and forms of education at each faculty and institute and it offers an opportunity to introduce innovations within the content and forms of courses, expanding the tuition in distance learning and the expert cooperation including training. Within the SME category, a small enterprise is defined as an enterprise which employs less than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million.

With respect to the importance of research results for a long-term university strategic development, it was decided not to organize the research by the means of sending questionnaires, but to employ the method of the standardized "face-to-face" survey interview conducted with the individual managers of each selected enterprise. This decision was also justified by a rather unsatisfactory experience from the previous correspondence research that was done through questionnaires: the response rate was about 15% and almost one third from the received answers

was unreliable and insufficient. Correspondence research where the response rate becomes more or less casual would not ensure a representative sample of a group of small entrepreneurs under research with respect to the area of their specialization in manufacturing and services and certain type of alternative energy source.

The questionnaire research conducted by the means of a standardized survey interview was executed by postgraduate students.

Using the database of enterprises provided by the Ministry of Industry and Trade CR, 30 small enterprises from different regions in the Czech Republic that were suitable for the research were chosen. The University representative (vice-rector) contacted by phone the individual directors of each selected firm, provided him/her with the information concerning the European RES COMPASS project and asked him/her about the possibility to conduct an interview on the given subject. He explained that the necessity of interview was motivated by an effort to innovate the study programmes and the course content both in the Czech Republic and in the foreign partner countries engaged in the project. He as well informed the prospective respondents that their firm would be visited by a postgraduate student and that the interview may, if necessary, enlarge its scope also in other areas, such as the possibility of a mutual cooperation of the firm and the university.

The management staff of the chosen firms was very helpful and kind and the meeting with 24 firms was without any difficulties arranged within a short time.

Research organization

The information which was supposed to be obtained from the managers of the chosen firms was formulated into alternative questions covering three fundamental focus areas of the research:

(1) Findings concerning the extent to which the small firm top managers operating in the area of renewable energy sources are informed about the current development. The question was whether they are well aware of the basic trends in the development of new technologies, legislative measures and whether they are able to formulate their own idea as for the importance of RES for the future.
(2) What is their idea as for the development of RES in their particular focus area and the future progress of their enterprises. What are their expectations, identification of opportunities or threats.
(3) What qualification they expect from their prospective employees, i.e. the undergraduate or graduate students.

Visiting the firm, questioning and preliminary elaboration of the results of the standardized survey interviews was in charge of postgraduate students. All interviewers were acquainted with the objectives of the RES COMPASS project as well as with a partial objective formulated under the third research component New businesses for SMEs in the RES.

Each interviewer tried out the process of questioning by the means of a simulation game: the teacher represented a firm manager – expert, the student stood for an interviewer. Students were told to study and use the methodological rules for the use of language operators for the quantification of the given answers (Havlíček and Pelikán 2006). The student – interviewer asked the previously prescribed questions which s/he nevertheless adapted at her/his own discretion. The teacher – expert answered the questions and deliberately diverted from the discussed topic. Students thus learned how to conduct the interview considerately and skilfully.

Thus properly trained, the students set out for the research. The transport was provided by the university and paid from the project budget. In the course of one day, each student conducted approximately 3–4 interviews.

RESULTS AND DISCUSSION

Targets

The approach goals satisfaction should be expressed by some metrics as one of the key indicators of both the efficiency and effectiveness of the approach (Beranková et al. 2008).

The standardized survey interview was carried out in 24 Czech firms operating in the area of planning, production and provision of services related to the RES. Table 1 presents an overview and basic information on the firms participating in the research:

The group did not include firms operating in the area of wind turbines since this sector does not occupy any significant position in the Czech Republic so far.

The selection of firms was carried out so that they would primarily represent the particular regions. Only 2 out of all monitored firms had their seat and operated in the capital city, 15 firms were seated in the regional or district cities, 7 firms in the provincial environment.

All firm managers had university education in the technical or economic field. According to the management, both technical and administrative staff had an appropriate university or higher college education in all monitored firms. Workers generally disposed of a different kind of qualification or they were un-

Table 1. Basic information on firms participating in the research

Firm focus area – main specialization	Number of firms in the group	Second subsidiary activity	Number of employees
Solar	7		32–80
Biomass and biogas	6		40–60
Biogas and municipal solid waste	4		25–40
Mini-Hydro	4	solar	20–25
Geothermal heat pumps	3	solar	40–60
Total	24		

skilled; they were trained on the continuous basis on the firm's costs.

The course of interviews

All students – interviewers – reported a positive evaluation of the whole research. The interview was in most cases attended by the firm directors or top managers, the discussion was pleasant, helpful and the interview usually exceeded the reserved half an hour and it lasted even more than one hour.

After the end of the standardized survey interview, there was usually a tour around the particular firm and a further informal discussion – primarily related to the problem of the education of graduate students, and the students' social and cultural needs.

After the end of an interview, each student – interviewer – was bound to arrange and classify the obtained information into three defined areas: (1) whether the expert had a profound knowledge on the global problems related to the renewable energy sources, (2) whether the expert is well aware about the current situation in the labour market and in the area of business and what new opportunities does he/she expect in terms of his/her own business, (3) what are his/her requirements concerning the qualification of the prospective staff intending to be employed in his/her enterprise after finishing the university studies.

Comparison of the information obtained in the Czech environment with other European states

The global research within the component New businesses for SMEs in the RES took place simultaneously in other EU states; the Great Britain, France, Spain, Greece and Finland. In these countries, the research was realized by the means of the standard correspondence method using questionnaires which the experts sent back after they had filled them in. The response rate was about 15%. The final set included 72 questionnaires obtained by the correspondence method and 24 questionnaires acquired in the Czech Republic by the means of the standardized survey interviews.

Research results in all seven participating states were compared, evaluated and joint together. The research that was carried out in the Czech Republic by the means of the standardized survey interview offered more detailed and accurate results but when comparing the data, it was confirmed that there are not any relevant differences in opinions as for business opportunities in the area of the RES between Czech and European entrepreneurs engaged in the research.

The first research area that identified what knowledge about the global problems related to the development of RES the top managers have had demonstrated that they draw the information from public media, magazines and publications dealing with a specific field linked with their enterprise. The extent of their knowledge may be characterized as a general awareness about global problems with only a thorough knowledge of the accompanying factors.

The second research area that focused on the managers´ idea of the development of technologies and market in their own field of business activity proved that they dispose of a pragmatic, detailed and realistic idea concerning their own perspectives. They can forecast the opportunities and threats related to their business and they are able to conceal their strong and weak points – probably as a means of protection against the competitors. Some research results are really remarkable and they may serve as an incentive for a further development of business.

The third research area that detected what qualification should the prospective employees, i.e. the undergraduate or graduate students, have, revealed that besides the expected requirement concerning the technical qualification, a new profile of prospective employee emerged: the manager of renewable energy sources who would be qualified for managing the integrated and shared energy systems and who

would be able to run complex projects, i.e. the projects "from the stage of development until recycling of waste materials".

RESULTS

During the evaluation of the future development in the area of RES and its impact on the development of small and medium-sized business in regions and on the increase in job opportunities for region inhabitants, managers of small firms relied on their own practical and pragmatic experience: monitoring the development of technology in their proper field of activity, monitoring the degree of interest on the part of customers, negotiating with customers, negotiating with suppliers and purchasers of technologies, the experience with the maintenance and service of the realized delivery of technological devices, monitoring the offer of competitors operating in the surroundings of the entrepreneur's seat. The evaluation of the future development in the area of RES and the possibilities for the development of small enterprises as well as the increase in job opportunities in regions is on the general level identical in all seven European countries involved in the project.

Rapid moral depreciation of the installed technologies

The fast development of new technologies – soft (SW, devices) and robust (machinery, material, technologies) – will have a considerable influence on the more rapid moral depreciation of the currently installed technologies. The managers' estimates concerning this issue imply that some devices are stricken with moral depreciation already after three years. The necessity to renovate the currently installed device will occur most probably earlier than the project expected. In case the given device is not renovated in time, its competitiveness regarding the growing prices for energy will be significantly reduced.

Entrepreneurs may respond to this situation by enlarging the scope of the maintenance services:

(a) offer a long term guaranteed service of maintenance and renovation submitted to the customer as a part of the installation set,
(b) provide the operators of energy devices with a permanent renovation by the means of the latest technologies as a part of their marketing strategy.

This would require the transfer of new technologies in the environment of small business and the continual education of the enterprise's key employees.

Joint sharing of the autonomous energy sources by groups of subjects

The experts consistently distinguish two types of the installation devices designed for energy production from the renewable sources of energy:

(a) installations intended for commercial purposes, i.e. the sale of energy,
(b) installations intended for the subject's own need.

It is especially the latter which the experts perceive as a space for further possibilities in terms of the development of business activities and job opportunities: it concerns projects of the joint share of different kinds of renewable energy sources by a group of various subjects. The current trend when a subject purchases one RES which he/she considers as the most convenient to his/her purposes will be no more sufficient in the future according to the experts. The experts suggest that the customers, in order to ensure their independence on the external natural conditions and after having taken into account the continuous growth in prices for energies, will be highly interested in the installation of at least two autonomous energy sources. As one of the interviewed experts states: "It does not refer to the situation when there are two neighbours living side by side, one of them having a roof oriented towards the east and the other one towards the west so they just agree to purchase joint solar panels and to use the energy from the sun the whole day." Projects of the joint sharing of energy sources for own usage emerge among the groups of various subjects so that sharing of the joint energy sources would bring all participants the synergic effect. As an example of such groups, it is possible to mention: groups of households; groups of households and producers; groups of villages; groups of villages and producers etc. It is probable that there will be even the groups across the regions or transnational groups. Within a group which will share the joint renewable energy sources, unique local conditions and opportunities will be exploited. Although such projects will require higher costs, the eventual expenses of the particular subjects in a group are supposed to be comparable with the individual investment in the energy source while being better appraised regarding the gained energy.

This anticipated trend in the RES exploitation brings about further possibilities as for the development of business activities and services:

(a) Joint sharing of various energy sources by groups of legal and natural persons will require special legal acts and maybe also new legislative measures.

It will be necessary to ensure the education for a new staff charged with these tasks.

(b) In terms of project preparation, it will be essential to carry out a more complex and comprehensive preliminary research related to the local natural conditions. It will be more demanding to comply with the requirements concerning the environment.

(c) Projects will become more complex and their preparation, permission and building negotiations as well as realization may provide new job opportunities for planning engineers or managers and the offer of jobs for auditors, building supervisors and continuous maintenance service workers will also expand.

(d) For small and medium-sized entrepreneurs, the trend of the joint sharing of RES represents both opportunity and threat. The enterprises which will manage to train their staff and to enlarge the scope of their focus towards other sources of energy will have a real chance to progress and to assume position in this relative market niche. The enterprises which will not succeed may, on the contrary, threaten their position within the business market.

Offer of complex services

The experts emphasize that the installation of a device producing energy from the renewable energy source represents only one out of many possibilities of ensuring the subjects' greater self-sufficiency in their energy consumption. No matter how efficient such a device may be, it will not ensure a sufficient performance unless other conditions such as the heat cladding of objects, the renovation of supply networks, a proper installation and an adjustment of forced ventilation, a continual device revision etc. are met. These services may become part of a complex service offer presented by a small firm and will ensure such a firm new customers.

DISCUSSION

Directors and managers of small firms operating in regions concentrate their attention on their immediate vicinity. They seem to be highly interested in the latest information concerning global problems in the area of energy sources. They gather the information from media but they do not feel any need to study this issue more profoundly. The object of their primary interest becomes the region in which they operate and the target group is represented by the region inhabitants to whom they offer job opportunities.

They distinguish between the exploitation of renewable energy sources intended for sale and the exploitation meant to improve the energy balance of inhabitants. The idea of joint sharing of different kinds of alternative energy sources by the groups of users intended for their own need may be interpreted as a reaction to the disappointment that commercial projects brought about to the region inhabitants: instead of the expected price reduction, there is a rise in the price for energy, instead of adopting the environmentally friendly attitude, a severe harm is done to the environment. Joint sharing of energy sources by the groups of inhabitants and the local producers and institutions may, according to experts, erase these problems: it is in their own interest not to devastate the environment in their close vicinity. Profit is distributed in the form of a cheaper, jointly produced and shared energy.

Experts suggest that the further development of small enterprises and increase in job opportunities for the region inhabitants in the area of RES depends on the ability to enlarge the scope of the complex service offer. Ideally, there is an enterprise that is able to provide those who would be interested with the installation of at least two different kinds of alternative sources as a "turn-key solution", i.e. the provision of the field research and the research surveying feasible possibilities, the project elaboration, the provision of building permits, installation, the continual innovation and the waste material recycling.

For some enterprises, this would represent an opportunity whereas the existence of other enterprises may be threatened.

A crucial role will be represented by education. Universities may ensure the transfer of the latest technologies into the environment of small firms and they may also prepare new study programmes which would graduate students able to work in complex services. In the area of renewable energy sources, it concerns the graduates who received the education across various faculties: the graduate should be familiar with the basic technological proceedings, s/he should work with projects and have a basic education in law, economics and management and should be able to understand the requirements related to the environment.

Development in the area of renewable energy sources cannot do without an external encouragement. As far as the state authorities are concerned, they may find there an opportunity to stimulate this development by the means of delivering target grants or support for pilot projects which would in particular prove and work out the possibilities of the joint RES sharing by various groups of inhabitants.

CONCLUSION

The development of small and medium-sized enterprises in a region simultaneously ensures the increase in job opportunities for the country inhabitants. Within the European Union "RES COMPASS" project, the research of 96 small enterprises operating in the area of RES in seven European states was carried out. Directors and managers of these enterprises – experts – presented their visions in terms of the prospective possibilities in the development of small business in regions. Realistic possibilities of the development of small enterprises appear to exist in the provision of more complex services which would react to (1) the needs of a more rapid renovation of morally depreciated devices, (2) the interest of inhabitants and producers in installations of at least two different autonomous alternative energy sources, (3) the creation of informal groups of users who will share various energy sources for non-commercial purposes and with the aim of improving their energy balance, (4) the need to support the installation of energy devices with other measures – heat cladding, as the heat cladding of objects, the renovation of supply networks, energy audits and projects.

The importance of biomass producers in the informal mutual share of energy sources is evident.

Business development requires the transfer of the latest know-how and technologies directly in the environment of small and medium-sized enterprises, which may be ensured by the universities. The universities are also challenged with launching new inter-field education programmes which would profile graduates with a larger scope of knowledge and skills: technic skills and knowledge of technologies, project management, economics, management, and the environment.

A targeted support for these processes should be provided by the grant agencies and funds.

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