International Journal of Economic Practices and Theories, Vol. 4, No. 2, 2014, Special issue on Marketing and Business Development, e-ISSN 2247–7225

www.ijept.org

Modern Heating Systems - Population's View and Perspectives

by
Timea Demeter, Gabriel Brătucu
Transilvania University from Brasov, Romania
timea.demeter@unitbv.ro, gabriel.brătucu@unitbv.ro

Abstract. Due to large changes in the extensive district heating networks in Romania, around the year 2000, the market for heating systems, presented new opportunities for private companies to start their activities in this field. The mainly demanded products were the micro thermal plants, due to their cost efficiency and the independence they provided, but with the disadvantages of high acquisition and installation prices, together with increased level of pollution. This determined buyers to focus their attention toward more modern solutions, such as, floor heating and radiant heating panels. Although these systems have been on the market for 5 years now, the majority of the population is still sceptical when it comes to using one. Based on this, the aim of the paper is to determine the view Brasov's population has on these modern heating systems, also providing a perspective for companies operating in this field. In order to determine this, a quantitative research was conducted, on 300 households. Because modern heating systems entered the market just 5 years ago, a very small number of studies were carried out in this field, providing this research a high level of innovation. The results present the heating systems most frequently used by the population, the main criteria taken into consideration when purchasing, the amount of money people are willing to spend on it, together with the level of awareness of the population regarding modern heating systems, and the reasons for which they are reserved when it comes to buying one.

Key words: district heating, floor heating, heating panels, micro thermal plant, modern heating systems
JEL classification: M30, M31, M37

1 Introduction

The considerable extent of district heating networks in the post-communist states of Eastern and Central Europe is a clear legacy of government policies dating back to the Communist era. These state owned systems were characterised by low productivity, inadequate equipment, poor maintenance and low consumer choice and flexibility. (Poputoaia and Bouzarovski, 2010)

The deficits coupled with the increasing energy prices determined the consumers to look for alternative heating solutions, opening this way a market for private investors that was not accessible to them before, attracting the producers of micro thermal plants, and later modern heating systems such as radiant floor heating and infrared heating panels.

Although the advantages of these modern heating systems are significantly higher than of micro thermal plants, the population still continues choosing them over the modern heating solution.

Due to the fact that modern heating system entered the Romanian market less than 5 years ago, very little research has been conducted in this field. In consequence, companies operating on this segment know little about the market trends and the way in which to approach the market in order to increase the demand for their products.

Therefore this study was undertaken to determine the view Brasov's population has on these modern heating systems, together with providing a perspective for companies to approach the market.

The paper intends to examine the population's awareness of the modern heating solutions, which segment is willing to buy modern heating systems in the near future as well as in the next 5 to10 years, the characteristics that influence the buying decision, the amount of money that is willing to be spent on heating/months and on purchasing the heating equipment, the most preferred modern heating system, and the main reasons for rejection when it comes to purchasing one.

2 Market evolution

After the communist era, the market for heating systems had two major players, the extensive district heating networks developed in the urban centres (Popovici, 2011), and wood stoves in the rural areas. (Colesca and Ciocoiu, 2013)

District heating (DH) is a technology that transmits and distributes heat from energy sources to residential, commercial and industrial consumers for space heating and hot water supply (Zhang *et al*, 2013).

In Europe the district heating developed especially after the Second World War. In those early days, most of the central heating systems used steam boilers (driven by coal fuel) and steam turbines. Iceland, Denmark, Estonia, Poland, Sweden, Slovakia, Hungary and Finland were the countries with the highest degree of centralization of thermal energy production. (Iacobescu and Badescu, 2011)

In case of Romania the entire service was centrally regulated and owned by the state, within a single public company—S.C. TermoelectricaS.A—being in charge of running it. (Poputoaia and Bouzarovski, 2010) This company was operating in 251 localities in the year 1990. (Iacobescu and Badescu, 2011)

After 1990 Romania has been affected by major political and social changes. The production of goods has decreased significantly. This led to a sharp decrease of the energy consumption in the industrial sectors (Iacobescu and Badescu, 2011) because of which the large industrial enterprises were requiring fewer or no heat services (Poputoaia and Bouzarovski, 2010) which led to lower income for the district heating company and the difficulty to cover its expenses.

Therefore many domestic users were also forced for economic reasons to disconnect from the district heating system. This led to the hydraulic misbalance of the distribution pipelines and decreased dramatically the overall efficiency of the district heating system. Due to the continuous decrease in population solvency yielded an increased rate of disconnections, the remaining customers were charged at higher prices Supply and billing of heat and hot water in the case of homes in collective apartment buildings was supported through a contractual relationship between the DH operator and the owners' associations that managed the buildings. Meters were installed at the level of the each building and the total cost was shared between flats on the basis of 'apartment cost allocators'. (Iacobescu and Badescu)

The lack of service improvement and adequate metering (in 2004, only 55 percent of the apartment buildings connected to DH networks had meters installed, although they were compulsory under the legislation in place) meant that customers were being charged ever higher prices for an increasingly poorer service because each radiator in a given flat was connected to the one in the apartment below or above it, but not to the remaining radiators in the same flat. This meant that heat control at the level of dwellings in collective apartment buildings was not economically feasible, since it required the technically difficult and capital-intensive instalment of multiple meters. It is also estimated that up to 77% of the thermal energy is lost in the district heating distribution network due to leaks and poor insulation of the piping. (Popovici, 2011)

This created a situation in which individual gas-fired heating appliances became more competitive than DH networks (Poputoaia and Bouzarovski, 2010) encouraging residential consumers towards the use of gas for heating rather than district heating (Kennedy, 2005)

Systems functioning on gas were micro thermal plants.

The *micro thermal plants* are gas-fired heating appliances that produce hot water used for heating, and for the household, categorizing the devices as mixed micro thermal plants and thermal plants only for heating.

They can also be categorized according to the way in which they are mounted as ones that are mounted on the floor and ones that are mounted on the wall. Most commonly is used the second one, having a power of 23-24 kW, and is recommended for apartments with 3-4 rooms. (Constructiv, 2003)

The suppliers of such devices exploited the shortcomings of DH through marketing campaigns that emphasized customer comfort and lower running costs.

Therefore the post 2000 year, phenomenon was the emerging market of micro thermal plants for apartment heating. It was accompanied by a massive process of disconnection of customers from the district heating. (Iacobescu and Badescu, 2011)

From the total of 2.696.000 apartments connected to the district heating, 581.000 were disconnected in 4 years period, meaning 21% of household users. As a result, the district heating units from cities smaller than 20.000 inhabitants were closed. Therefore from a total of 184 systems that were functioning in 2002, more than 40 were closed in the years 2003 and 2004.

In the winter 2008–2009 about 1,800,000 apartments were fed with heat from centralized systems and the average national level of the apartments connected to DH was approximately 65% Representing an average consumption of 19000-21000 GWth/year. (COGEN Romania, 2013)

To diminish the disconnection rate, DH companies imposed additional bureaucratic requirements for the disconnection to be approved. This contributed to the perpetuation of the negative image of DH as an expensive, top down and poor-quality service (Poputoaia and Bouzarovski, 2010).

A direct social support scheme has been functioning since 2003 to address the social impacts of increasing DH prices. It provide financial assistance to low income households by covering a given percentage (10–90%) of the DH bill, and by granting a fixed level of income support towards the payment of gas bills among targeted households (Poputoaia and Bouzarovski, 2010) But these subvention ceased from the year 2007 (COGEN Romania,2013).

This determined more and more people to focus their attention towards micro thermal plants. In their buying decision the main criteria was the price, the brand and the facilities it offered. As a result this market started to present a great potential and several companies entered this field, becoming the main products of the heating market by 2005.

The onset of the global financial crisis in late 2007 set in motion a series of events that caused rising political, economic, and social tensions. (Gheorhge and Muresan, 2011)

The price of natural gas began to continually increase (in 4 years rising 100%) and the price of thermic energy increased with 80%-100%, while the price of electricity increased only with 19%. (Incomemagazine, 2013)

This resulted in consumers looking for more comfortable and more cost efficient heating solutions, based mainly on electricity, while the demands of the residential service sector substantially decreased for the micro thermal plants.(Zhang *et al*, 2013) Adding the fact that the acquisition and installation of gas-fired heating is a capital-intensive and time consuming process. (Poputoaia and Bouzarovski, 2010)

After 2008 the legislative frame was also discouraging the acquisition of micro thermal plants, especially because the European Union was planning to impose a pollution tax on the owners of this kind of systems. Together with the local government, innovative heating systems that are eco efficient are being encouraged. (Rezessy *et al*, 2006) For instance the government of Sweden grants subsidies for households that are willing to implement brine/water-based heat pump or a boiler fired by wood pellets (Mahapatra and Gustavsson, 2008) while the Spanish government financed to a large extent solar energy projects (Patlitzianas and Psarras, 2007).

According to the current trends there are several innovative heating systems, such as heating systems using Geothermal energy, solar energy, radiant floor heating and radiant heating panels.

Romania, together with other neighbouring countries (Hungary, Serbia) has important low-enthalpy geothermal resources suitable for direct heating applications, with major potential locations in the Western Plain.

Unfortunately many geothermal sites are used solely for recreation, because Romania

possesses mostly low-enthalpy geothermal resources.

The exploration of these resources began in the1960s. The main uses are in district heating, health and recreational bathing, greenhouse heating and aqua culture. The geothermal resources aren't exploited at their full potential because of the higher costs of the technologies required and lack of funds. Therefore all systems using this technology for heating are very expensive.

Several technologies are also used to harness the sun's radiation into useful energy in the form of heat (solar heating) or electricity (photo voltaics). Photo voltaics (PV), which convert sun light directly to electricity, is the single technology used in Romania. The country is not prepared for complicated technologies using Concentrated Solar Power (CSP), which uses mirrors and reflectors to create a beam of energy from the sun's rays. (Colesca and Ciocoiu, 2013) Just like in the case of geothermal heating this solution also has a high cost to implement.

The *radiant floor heating* systems offers distinctive advantages in several special applications and allows the use of low temperature heat.

Radiant heating systems usually consist of small pipes, embedded in masonry floors or in prefabricated panels in which hot water flows. Furthermore, these systems allow a good flexibility in modifying the internal partitions of the indoor space; above all, in high spaces (e.g. churches, gymnasia, etc.), they allow a good thermal comfort, otherwise difficult to obtain. (Fontana, 2011)

There is also available a light system, however, the pipes are placed in aluminium foil. Comparatively, lightweight radiant floor heating (LRFH) system is characterized by quicker heating, less loss of the floor height and less floor load, etc. because of its special floor construction framework. (Zhanga *et al*, 2013)

The third type is the one based on electricity, composed of metal layers, and has a durability of 15 years, and can be placed under various surfaces such as hardwood, tile, marble, stone, carpet, wallpaper, concrete, asphalt, paving stone, cement, artificial grass, etc.

The *radiant heating panels* are made of heating wire mat embedded in a layer of electric insulating polymeric material pasted from both sides with thin polymeric sheets. This combination emits infra-red heat through the radiating front panel, and this heats all the objects in the room, which in turn heats the air, obtaining as a result the same temperature in the entire room, without drying out the air.

The electric circuit inside is equipped with a thermostat that keeps the panel surface temperature between the range of 80-95 ° C.

The panel is fitted with a two-stage switch, I and II, thus providing the possibility of using it at maximum power or just at 50% depending on the warmth needed.

This paper will discuss the last two innovative heating methods, due to their financial accessibility to the Romanian market. The first two methods, as mentioned before, are very expensive taking into consideration the initial investment involved.

3 Research methodology

In order to obtain the answer to the previously stated questions, a quantitative research was conducted between Brasov's inhabitants.

The research population, just as the target market of these products, include individuals both male and female, who own at least one household or apartment, knowing that only in that situation they can express a valid opinion about the heating system they are using or intending to use. During the sampling process it was taken into account the age and gender structure if Brasov's population, based on the last Census performed in 2011.

As sampling method, both simple random sampling and Systematic sampling were used. First, the city of Brasov was divided in 17 zones, while in the zones the streets were chosen randomly but there number in proportion to the total number of streets in that specific zone. After which the individual households from the included streets were

determined using systematic sampling with the sampling interval of 5, totalling a number of 308 households from which the date was later collected.

The questionnaire is comprised of 17 questions based on the research objectives, from which 1 open question, 3 dichotomous questions, 5 Determinant-choice question, 2 checklist questions, 2 filter questions, and 4 characterising questions.

The obtained data was processed and analysed using SPSS.

The relationship between the characteristics of the population and their choices were verified by applying the Chi square test, in SPSS using the crosstab function. The theoretical value for the test was calculated in Microsoft Excel, using the CHIINV function with a probability of 95% and a degree of freedom 1.

4 Results

After conducting the research the following results were obtained.

The majority of the population is using the micro thermal plants, covering 68% of the total, while 5% of the respondents are still connected to the district heating system, and 4% are using modern heating solutions.

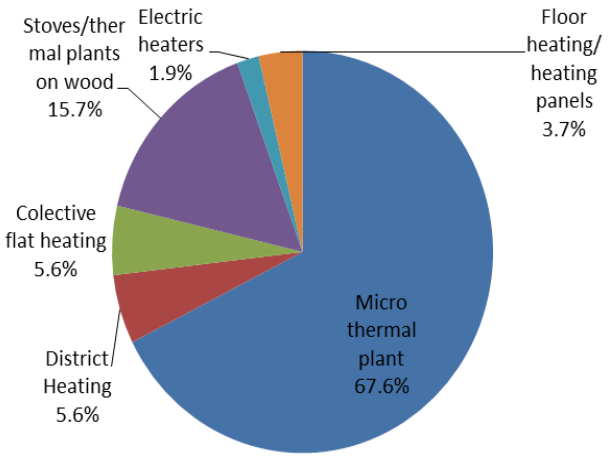

Figure 1: Usage of heating methods among respondents

Taking into consideration the level of satisfaction of the respondents, 84.4% are satisfied or very satisfied with the method they are currently using while 5.5% are unsatisfied or very unsatisfied, according to table 1.

On the short term, 88% of the research population is not willing to purchase a heating system to replace the current one leaving a percentage of 12% that are interested in purchasing.

On the level of the research population the highest percentages of the respondents that are interested in purchasing a new heating system are the ones using the micro thermal plants with 8.3% while the ones currently hooked up to the district heating representing 2.8%.

However according to the method currently used 50% of the respondents using district heating are determined to find another solution in the near future, and only 12.3% that use micro thermal plants are looking for alternative methods.

Users of the other 4 methods presented are not willing to buy heating systems in the near future therefore not being part of the targeted market for the short term conforming to table 2.

According to the research the most important characteristic to influence the buying decision is the low monthly consumption of the product followed by a low acquisition and installation cost. Features like user friendliness and design are less important.

Thus, the amount of money that the respondents are willing to spend on a heating system at the level of Brasov is comprised in the interval of 3248 lei and 5868 lei. However, 18.5% of the researched population is not determined to spend over the average of 2000 lei. Therefore it is the most appropriate to use the value of the median 3000 lei in this case, while the monthly consumption/room is between 51 and 100 lei (53%). Although 37% would like to spend less than 50% and 10.2% would spend up to 150 lei.

When it comes to population's awareness of modern heating systems, 91% of the researched population have heard about the existence of these products, and 71% would be interested in purchasing them on the long run for supplementing (58.7%) or entirely replacing the system currently owned. The total of 71% comprises 49.4% of micro thermal plants, 6.2%

of district heating, 4.1% of collective flat heating 9.3% of wood stoves, and 2% of electric heating users.

Table 1: Level of satisfaction in relation to the heating method used

			How satisfied are you with your current heating method?					Total
			Very unsatisfied	Unsatisfied	Neutral	Satisfied	Fully satisfied	
What kind of heating system are you currently using?	Micro thermal plant	% of Total	.0%	3.7%	4.6%	34.3%	25.0%	67.6%
	District heating	% of Total	.9%	.0%	1.9%	1.9%	.9%	5.6%
	Collective flat heating	% of Total	.0%	.0%	.0%	1.9%	3.7%	5.6%
	Stoves/thermal plant on wood	% of Total	.0%	.9%	1.9%	4.6%	8.3%	15.7%
	Electric Heaters	% of Total	.0%	.0%	.9%	.9%	.0%	1.9%
	Floor heating/heating panels	% of Total	.0%	.0%	.0%	1.9%	1.9%	3.7%
Total		% of Total	.9%	4.6%	9.3%	45.4%	39.8%	100%

Table 2: Willingness to purchase a heating system according to heating method use

			What kind of heating system are you currently using?						Total
			Micro thermal plant	District heating	Collective flat heating	Stoves/thermal plant on wood	Electric Heaters	Floor heating/ heating panels	
Are intending to purchase a heating system in the following 12 months?	No	% within What kind of heating system are you currently using?	87.7%	50.0%	100.0%	94.1%	100.0%	100.0%	88.0%
		% of Total	59.3%	2.8%	5.6%	14.8%	1.9%	3.7%	88.0%
	Yes	% within What kind of heating system are u currently using?	12.3%	50.0%	.0%	5.9%	.0%	.0%	12.0%
		% of Total	8.3%	2.8%	.0%	.9%	.0%	.0%	12.0%
Total		% within What kind of heating system are u currently using?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100%
		% of Total	67.6%	5.6%	5.6%	15.7%	1.9%	3.7%	100%

From the two researched modern systems, the 71.4% prefer the floor heating while 28.6% would rather purchase heating panels, from which 68.4% prefer the ones that are installed on the wall, and 31% that are mounted on the celling.

The main reason for rejecting the modern heating systems is that 53% of the respondents that choose not to purchase a modern heating system in the future are fully satisfied with the method currently being used, while 28.6% perceive them as being too expensive to purchase followed by 10.7% who consider that

they have a high consumption and 7.1% consider them unhealthy.

According to the results of the Chi square test, at the level of Brasov's population there is no difference in preferences between the people who live in flats and people who live in house. Basically from the two heating methods, they both like more the radiant floor heating systems. However, at the level of the researched sample 70% of the respondents who live in a house prefer radiant floor heating systems and 30% prefer radiant heating panels, while amongst the respondents living in a flat 72.4% prefer the radiant floor heating systems and 27.6% the radiant heating panels.

5 Approaching the market

When it comes to approaching a market, a significant difference has to be made between the short term, and the long term strategies. Each of these contains a different combination of elements that lead to the desired outcomes.

Based on the obtained results, the most unsatisfied users are the ones that are still connected to the district heating systems, but the owners if micro thermal plants are not fully satisfied either. The dissatisfaction of district heating customers leads to the need for new heating systems, hence their willingness to find another heating solution in the near future.

Therefore on the short term, the main targeted market for companies operating in the field of modern heating systems is the population who is still connected to the district heating, representing 5% of the total market.

Yet the other segments are also worth being taken into consideration, due to the higher percentage of respondents interested to purchase in the future, compared to the percentage of unsatisfied users, meaning that even satisfied users are keeping an open mind and an increased interest towards alternative methods.

However the approach towards this segment should be on a long term and comprised of different strategies, then the one for short term, knowing that they have different profile opposed to users of district heating. The 4% of the users who have a modern heating solutions point out that the market is opening up, and that there already are satisfied and very satisfied users of these products.

5.1 Short term approach

This approach has as main target the population that is still connected to the district heating systems. Due to inefficiency of this solution, and the high dissatisfaction, its' users have to find a method to replace them in the following 2 years. Therefor the adopted strategies have to be applied while this segments still exists.

Although the population is aware of the existence of the modern heating systems, their knowledge is very weak, and not accurate. The reasons for not purchasing one are not valid, and illustrate the lack of information related to these systems. Therefore, when developing the marketing mix the main factors influencing the buying decision has to be highlighted, such as the consumption which should be lower than 100 lei/month/room coupled with the purchasing price which has to be a value below 58000 lei in accordance to the size of the home.

Another emphasis should be placed on the user and eco friendliness of the products and to their easy installation process in the case of heating panels. However due to new technologies installing the floor heating became also very simple, and doesn't involve very high investments, facts to be underlined by heating system companies when it comes to promotion, especially because most of the population prefer these modern heating systems opposed to heating panels.

Being no difference in preferences between the preferences of people according to the household they live in, both floor heating and heating panels should be advertised.

The easiest way of informing the population is through flyers spread in areas where the inhabitants are still connected to the district heating, together with setting up a website where the prices, the consumption and the functioning principle of the modern heating systems are explained very clearly, eliminating

this way the reasons for which some of the people are reluctant to buy them.

5.2 Long term approach

As mentioned before, on the long term, different approach is applicable, due to the profile of the targeted population. This segment is characterised by customers who don't have the urgent need to replace the heating system they are using. Most of them are satisfied with the one they have or even if complaint arises, they are more willing to supplement the existing one rather than entirely replacing it.

As the results show, the most willing segment to open up towards modern heating systems on the long term are the owners of micro thermal plants, therefore is crucial to highlight the advantages of modern heating systems as opposed to the micro thermal plants, by placing a large emphasis on their cost efficiency and eco friendliness and introducing them as a means of supplementing the heating method being used. Convincing this way the user of its' advantages and in time determining one to fully replace the existing system.

The constant price of electricity and the increasing price of gas coupled with the ecologic regulations imposed by the European Union, represent an advantage for the commercialises of modern heating systems, thus encouraging the population to buy modern heating systems.

If implemented properly, the short term promotion should result in increased market share of satisfied modern heating system users, increasing the overall confidence of the population.

Another way of informing the population about the advantages of the systems is trough articles written in interior design and construction magazines, as well as on conferences and fairs with this profile.

Therefore, on the long run, the modern heating system should be positioned as an easy, eco-friendly, and electricity based solution that offers de advantages and combat's the disadvantages of micro thermal plants.

6 Conclusions

The drastic changes in the heating sector, first opened up a new market, later demanded from the players on it, to adapt to the changes. Due to the rapid movement of the population to transfer itself from the district heating to other methods, companies operating on this market had little time to observe the adjustments and trends that the market adopted, developing the need for a research on this topic.

The most adequate research method to establish the view Brasov's population has on these modern heating systems is by performing a quantitative marketing research, which was applied on a sample of 304 households chosen using simple random sampling and Systematic sampling.

As the results show, the main way to approach the market is by dividing the population in two segments, containing potential customers that have to be approached on the short term and ones that have to be considered on long term.

The short term approach has to be one comprised in a 2 years' time period, and concerns the population that is still connected to the district heating systems where the element of success is informing them about the advantages of modern heating systems opposed to other methods, and shattering this way the false assumption they had about them.

The long term approach puts a higher emphasis on using modern heating system to supplement the existing one, making it more familiar with the population, and resulting in an eventual replacement of the old methods.

References

Brkic, D. and Tanaskovic, T. (2008), Systematic approach to natural gas usage for domestic heating in urban areas, *Energy*, 33: 1738-1753.

COGENRomania,(2013), Despre noi www.cogen.ro/index.php?f=despre&lb=roS Accessed 19 June, 2013.

Constructiv (2003), Piata sistemelor individuale de incalzire in crestere, www.constructiv.ro/content/piata-sistemelor-individuale-de-incalzire-crestere. Accessed 19 June, 2013.

Colesca, S. E., Ciocoiu, C. N. (2013), An overview of the Romanian renewable energy sector, *Renewable and Sustainable Energy Reviews*, 24: 149-158.

Diaconu,O., Oprescu,G., and Pittman, R. (2009), Electricity reform in Romania, *Utilities Policy*, 17: 114-124.

Fontana, L. (2011), Thermal performance of radiant heating floors in furnished enclosed spaces, *Applied Thermal Engineering*, 31: 1547-1555.

Gheorge, A. and Muresan, L. (2011), An Energy security strategy for Romania: Promoting Energy efficient and renewable Energy Sources, *Energy Security: International and Local Issues, Theoretical Perspectives, and Critical Energy Infrastructures*, Springer Science +Business Media.

Iacobescu, F. and Badescu, V. (2011), Metamorphoses of cogeneration-based district heating in Romania: A case study, *Energy Policy*, 39: 269-280.

Incomemagazine (2013), Piata sistemelor de incalzire va profita de criza económica, www.fin.ro/articol_20489/piata-sistemelor-de-incalzire-va-profita-de-criza-economica.html. Accesed 25 August, 2013.

Kennedy, D. (2005), South-East Europe Regional Energy Market: challenges and opportunities for Romania, *Energy Policy*, 33: 2202-2215.

Mahapatra, K. and Gustavsson, L. (2008), An adopter-centric approach to analyze the diffusion patterns of innovative residential heating systems in Sweden, *Energy Policy*, 36: 577-590.

Konstantinos D.,Patlitzianas, K.D. and Psarras, J. (2007), Formulating a modern energy companies' environment in the EU accession member states through a decision support methodology, *Energy Policy* 35: 2231-2238.

Popescu, D.,Bienert, S.,Schützenhofer, C. and Boazu, R. (2012), Impact of energy efficiency measures on the economic value of buildings, *Applied Energy*, 89: 454-463.

Popovici V. (2011), 2010 power generation sector restructuring in Romania—A critical assessment, *Energy Policy*, 39: 1845-1856.

Authors description

Drd. Timea Demeter is a PhD student at the Marketing department from the Faculty of Economics and Business Administration, Transilvania University of Brasov. Having a background in both marketing and management, her research interests now include customer behavior analysis, market research as well as developing marketing strategies and policies that are applied in the field of tourism.

Prof. univ. dr. Gabriel Brătucu is a graduate of the Faculty of Commerce, from Bucharest Academy of Economic Studies (1989). He has a PhD degree in economics in the field of Marketing (1995) and he is a Professor since 2002, and PhD supervisor since 2005. He is coordinator of the Masters of research study "Marketing Strategies and Policies", editor in Chief of Bulletin of the Transilvania University of Brasov Series V Economic Sciences, member of the General Association of Economists from Romania (AGER) and member of the Economist's club from Brasov (CEB), author and co-author of 22 books with ISBN, 7 lectures and over 300 articles.