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ENERGY, CLIMATE CHANGE AND SUSTAINABILITY

Proceedings of the 10th International Conference on Business Excellence

Business Excellence
Bucharest 2016

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International Conference on Business Excellence in Energy, Climate Change and Sustainability

The 1st **International Conference on Business Excellence in Energy, Climate Change and Sustainability** was an international scientific event focused on research in the field of energy business, joining more than 50 participants from Romania and abroad as experts, professors, students and media representatives interested in this challenging topic.

The conference was organised by **Society for Business Excellence** in cooperation with **The Bucharest University of Economic Studies, UNESCO Department for Business Administration, and the MBA program "Entrepreneurship and Business Administration in Energy".**

The plenary session joined the most recognized specialists in the energy field as Marius Stan (U.S. Department of Energy Office of Nuclear Energy), Valeriu Binig (Partner at E&Y Romania), Corina Popescu (State Secretary at the Ministry of Energy), Ion Lungu (President of AFEER-Association of Energy Suplliers), Iulian Iancu (President of Industry Commission in Chamber of Deputies, Romanian Parliament), Constantin Bratianu (ASE Bucharest) and Radu Dudau (Senior Consultant for the Minister of Energy) to the energy community.

The media partners for this conference as Investenergy, Focus-energetic, Energynomics and Agerpres considered that the conference was important not only for its research topic but also as a stepping stone event for the improvement of the relationship between university and business environment in the energy field.

The main research topics presented at the conference included: European Energy Strategies, Energy Planning, Electricity Market Auction Settings, Strategic Choices in Energy Sector in Crisis, Fuel Cell Systems and Environmental Consequences for using Hydrogen**,** Efficiency in Solar Power Plant, Risk Management Method in PV, Development of Wind Parks in the European Union, Management of Secondary Energy Resources, Romanian Energy Future Market Design, Strategic Models for Corporate Entrepreneurship, Business Models in the Oil Industry, Azerbaijan-Georgia-Romania Interconnector, New Solutions for Oil and Gas Upstream.

All presentations and debates support the main objective: to provide direct access to key specialists in the energy, climate and sustainability field and disseminate new ideas in this challenging field.

Editors

CONTENTS

Section A: Business Energy and Climate Change

Section B: Business Sustainability

Section A: Energy Business and Climate Change

European Energy Strategies

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Abstract. *The purpose of this paper is to present some of the new European strategies for energy in the context of the Energy 2020 vision for competitive, sustainable and secure energy. Energy strategy is a semantic construct that integrates strategic thinking with the development of the energy sector within a given country, region, or continent. Strategic thinking has been based decades ago, especially in the energy sector on deterministic and linear models which yield good results in economies with a predictable development. Due to political changes in the Eastern European countries and significant changes of their economic development, as well as increasing the globalization process, the economic business environment became very dynamic and highly unpredictable. In this context strategic thinking should change to new probabilistic and nonlinear thinking models. Also, building up new strategies for Europe means to consider the global environment of energy sources dynamics and the restrictions imposed by the natural environment protection. The paper presents in the first part the paradigm shift in strategic thinking and strategies elaboration, and in the second part the strategies proposed by the European Commission for the energy sector up to 2020. The main finds show a change in the strategies structure, and ways to implement in Europe a new vision for the energy transport systems based on a centralization philosophy.*

Keywords: electricity system, emergent strategy, energy, energy strategy, European Commission, strategic thinking

Introduction

Strategy is a powerful concept but it is rather difficult to find a single definition accepted by all the authors. That is because strategy is about the future, and future is perceived in different modes by different people. Future is not a simple extrapolation of the present. It is a probable context of events that extracts from the present the main ingredients but it will be shaped in a quite new environment. Future evolves from the present but it contains probable events that can be more or less anticipated and that can be perceived as opportunities or threats. According to Leif Edvinsson (2002, p. 79), "What we have to do is get a perspective on the evolving future, see the different opportunities and then put our brain potential into immediate action – internally as well as externally". Future means lack of knowledge, and uncertainty. Thus, any strategy must be able to achieve an objective in a possible future by trying to reduce uncertainty and gain knowledge for decision making.

One of the classic definitions of strategy has been given by Alfred Chandler (1963, p. 13): "the determination of the long-run goals and objectives of an enterprise". This definition integrates three main ideas: 1) defining one or several important objectives for a possible future; 2) finding a way to achieve those objectives; 3) allocating efficiently the organization resources. Johnson, Whittington and Scholes (2011, p. 4) define a strategy as "a long-term direction of an organization". Thus, strategy is a way decided by the top management to achieve a long-run objective based on long-term rational planning and the assumption that the external business environment is stable or it has a predictable evolution (Mintzberg, 2000; Whittington, 2001).

The last decades showed that the assumption of stability and predictable evolution does not stand anymore. The business environment became turbulent and highly unpredictable. In that situation a strategy based on a rational and deterministic planning cannot be successful. The way in which we conceive a strategy should be change, by incorporating probabilistic and nonlinear thinking models (Bratianu, 2007, 2009). That is also valid for strategies developed for the energy sector where the predictable evolution of economic growth in the European countries is counterbalanced by many uncertainties concerning energy supplies due to market fluctuations and regional wars, as well as new economic crises with unpredictable consequences.

The purpose of this paper is to present a shift in the strategy thinking and how it is reflected in the European Commission new energy strategies, especially those in the electricity transport networks.

Strategy paradigm shift

The old strategy planning based on determinist and linear thinking is not efficient anymore in the context of the new turbulent and unpredictable business environment. Strategists should be able to develop their skills of working with probabilities, uncertainties and lack of significant knowledge in making decisions (Spender, 2014; Taleb, 2012). As Taleb (2012, p. 4) asserts, "The antifragile loves randomness and uncertainty, which also means – crucially – a love or errors, a certain class of errors. Antifragility has a singular property of allowing us to deal with the unknowns, to do things without understanding them – and do them well". In that context, strategizing (Spender, 2014) means to reduce uncertainties related to the future and its absence of knowledge. That means to develop a creative thinking model which is able to generate knowledge and thus find new ways of achieving the long-run objectives.

Strategic planning was introduced by authors such as Chandler (1963) and Ansoff (1965). The main idea of strategic planning was to set up one or several long-term objectives to be achieved in a predictable future, and to choose a set of decisions concerning allocation of resources for achieving those objectives. Those planned strategies could cover a period of 5-10 years without the risk of major changes in the economic environment. Today, such a planning approach would not produce the anticipated results since during a period of 5-10 the economic environment may change dramatically, including to experience some economic crises. Let us not forget the European energy sector breakdown during the oil crisis in 1973. That was a turning point in re-thinking all the energy strategies in the European countries and in promoting aggressively nuclear power to assure the energy security, especially of France, Germany and UK.

Strategic planning is not a roadmap since the way toward the future is not like a highway. Analogy can be better made with surfing and the unpredictable waves of the ocean. Changing the analogy, many authors changed their view about strategies and developed the concept of *emergent strategies* (Bratianu and Bolisani, 2015; Grenier and Cummings, 2009; Mintzberg and Waters, 1985; Nonaka and Zhu, 2012; Spender, 2014). Emergent strategies are reactions to the unpredictable changes in the business environment. They can answer much better to the needs of the company than deliberate strategies, but only managers are able to integrate them in the overall strategic thinking. Thus, the best way of conceiving a strategy is to take an integrated approach. That means to start with a deliberate strategy based on the available knowledge and vision of the company, and to conceive a generic framework for the decision making process. Then, to answer to the emergent future with many unpredictable opportunities and threats with a generic strategy built within the generic framework. Thus, by integrating the emergent strategy into the deliberate framework one obtains a complex and dynamic structure of the strategy able to achieve the established objective. Figure 1 illustrates such an integrated strategy composed of a deliberate strategy and an emergent strategy.

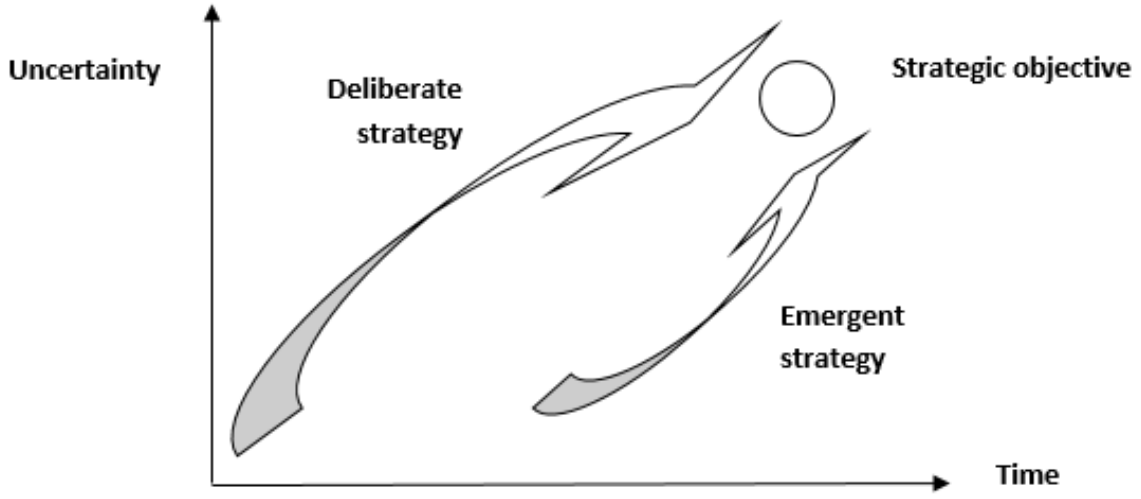

Figure 1. **Illustration of an integrated strategy**
Source: Author's own illustration.

Energy strategies in Europe for increasing energy generation by using renewable resources

Energy sector is a rather complex one structured usually into three main domains: energy generation, energy transportation, and energy consumption. Each domain has got specific characteristics and any strategy should be able to achieve objectives in concordance with them. Power generation in the European countries changed its structure in favor of renewable energy, due to increased levels of protection for the natural environment and reduction in air pollution. EUROSTAT data published on May 2015 shows that in 2013 in the EU-28 zone energy generated in classical power plants using coal, oil and gases represented 49.8%, energy generated in nuclear power plants represented 26.8%, and renewable energy represented the rest 23.4% (i.e. hydropower 12.8%; wind turbines 7.5%; solar 2.7%). It is interesting to note that during the period of 2003-2013 the energy generated in classical power plants decreased from 56.4% to 49.8%, and the nuclear energy decreased from 30.9% to 26.8%. In the same period of time, solar energy increased from 0.01% to 2.7% and the energy produced in wind turbines increased from 1.4 to 7.5%.

These above results came as a result of the European Commission policies and strategies to decrease energy generation in fossil fuels plants and in nuclear power plant and to increase energy obtained from all renewable energy forms. For illustration I shall present some ideas contained in the Directive 2009/28/EC of the European Parliament and of the Council from 23 April 2009, on the promotion of the use of energy from renewable sources. As it is mentioned in the document, "This Directive establishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport" (Directive 2009/28/EC, p. 27). The Directive makes also connections with the efficiency of energy consumption and suggests generic ways of integrating strategies for both increase in renewable energy sources and increase in efficiency of energy consumption.

By "energy from renewable sources" the Directives means energy that is generated from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass landfill gas, sewage treatment plant gas and biogas. By "biomass" the Directive means the biodegradable fraction of products, waste and residues from biological origin 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. By "biofuels" the Directive means liquid or gaseous fuel for transport produced from biomass.

The main issue of this Directive concerning renewable energy consists in re-iteration of the strategic objective set up in the previous document issued in 2007 entitled "Renewable Energy Roadmap – Renewable energies in the 21st century: building a more sustainable future", which is to have a 20% target for the overall share of energy from renewable sources and a 10% target for energy from renewable sources in transport. These strategic objectives should be achieved by developing sustainable national schemes, combined with an increase of efficiency in energy consumption. For instance, promoting in transportation in crowded cities of cars of reduced geometrical dimensions and reduced engine powers, together with increased use of electric cars with higher performances.

The Directive emphasizes the importance of developing new technologies, and moving toward decentralization strategies in implementing projects based on renewable energy sources. This very interesting since it comes as an opposite strategy from the use of large power plants in generating electricity, like those based on fossil fuels and those based on nuclear fuels. Thus, decentralization may have many benefits "including the utilization of local energy sources, increased local security of energy supply, shorter transport distances and reduced energy transmission losses. Such decentralization also fosters community development and cohesion by providing income sources and creating jobs locally" (Directive 2009/28/EC, p. 16).

Analyzing this strategy set up by the Directive 2009/28/EC we see that there is a deliberate strategy component which yields the framework for increasing the participation of the energy renewable resources in the spectrum of energy generation modes, but also it contains possible emergent strategies which will be developed by the member states in concrete given conditions since energy sources distributions, classic, nuclear and new is not uniform and each country should take advantage of its own natural resources. For instance, it is quite normal the Northern European states to benefit more of the energy produced in hydropower plants, while the Southern European countries to take advantage of solar energy.

In a document released in 2011 by the Directorate –General for Energy (Energy 2020), a thorough analysis is made on the implementing the strategy outlined in the Directive 2009/28/EC and the conclusion is the following: "The quality of the National Energy Efficiency Action Plans, developed by the Member States since 2008, is disappointing, leaving vast potential untapped. The move towards renewable energy use and greater energy efficiency in transport is happening too slowly. While we are broadly on track for the 20% target for renewables, we are a long way from achieving the objective set for energy efficiency" (Energy 2020, p.5). The document considers that is necessary a new energy strategy, which means actually an emergent strategy, based on the following priorities:

1) Achieving and energy-efficient Europe.
2) Building a truly pan-European integrated energy market.
3) Empowering consumers and achieving the highest level of safety and security.
4) Extending Europe's leadership in energy technology and innovation.
5) Strengthening the external dimension of the EU energy market.

This new perspective confirms the new structure of the energy strategy and the dynamic interplay between the deliberate strategy and emergent strategy aiming toward the same strategic objectives. As it is underlined in the Working Document (EC-Working Document, 2011, p. 4), "Long term perspectives should not imply lack of flexibility and our policies should be adaptable to new global opportunities and challenges as for example the economic crisis, the impact of unconventional gas, new technology breakthroughs etc.". The generic framework will contain intermediate milestones and action plans on shorter intervals e.g. 3 years, which will be designed as emergent strategies since they will consider the new changes in the turbulent business environment and technology disruptive innovations.

Energy strategies in Europe for future European electricity system operation

I shall extract some important ideas from the elaborated analysis performed by Slot et al. (2015) concerning options for future European electricity system operation, and I shall integrate them into the generic framework for the energy strategy. The authors

emphasize from the very beginning the fact that system planning and system operations are executed in different time-frames before the actual transport of electricity to takes place. In figure 2 there is an illustration of these time-frames.

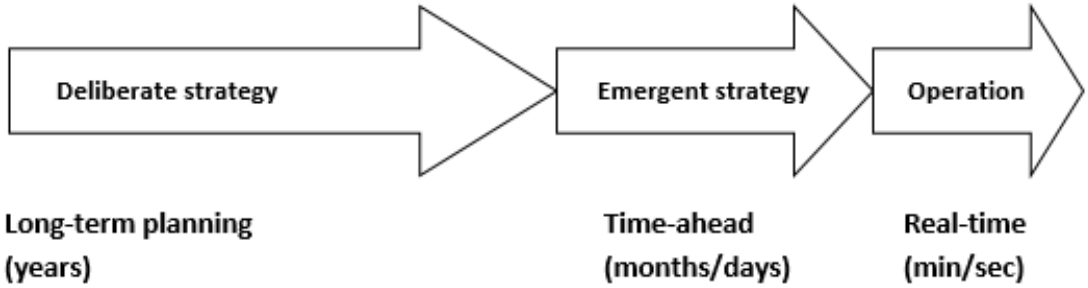

Figure 2. **Illustration of different time frames**

Source: Slot et al., 2015.

What is new in this vision, it is the idea of centralization of the electricity transport system, from the national level to the regional level. If for developing energy generation units based on renewable energy resources the European strategy asks for decentralization, for developing electricity transport systems in the next future the European strategy is for centralization. That is a very interesting combination between decentralization and centralization. This centralization should be done before the real-time operation begins. According to Slot et al. (2015, p. 5), "the target model for 2020 is to erect Regional Operational Centers (ROCs) throughout Europe in which the operation system before real-time functions are centralized, thereby centralizing authority over the functions across larger geographic areas". That means the following:

- The aim is to remove national borders between countries as much as possible by operating them as 'normal' connections within the control area of a ROC.
- Both the deliberate strategy and emergent strategy should be executed at pan-European level, coordinating the developments in the geographic regions of the different ROCs.

For such a vision to be adopted it is necessary that EC ensures the legislative power for the pan-European level, and that the European regulatory body will have the power to independently check the formulation and execution of methodologies, processes and procedures in line with the general policy. Regional centers (ROC) will execute prescribed tasks in concordance with the formulated methodologies, processes and procedures. Then, in each member state should be adopted new legislation concerning the operation of the electricity system under the new centralized authority of the ROCs.

Conclusion

The paper presents a new vision concerning elaboration and structure of generic strategies by considering both a deliberate strategy and an emergent strategy. The deliberate strategy creates a thinking framework based on a pro-active attitude and a planning exercise. The emergent strategy comes into play in the latter part of the long-term planning as a reaction to the new changes which might happen in the business environment. In the second part, the paper presents how this new strategy structure applies to the European energy strategy. Due to the complexity of the energy domain, the paper considers only the strategy to increase the presence of the energy generation in the renewable energy sources and to the electricity system operation at the pan-European level. The interesting aspect of this new vision of the European Commission

consists in calling for a decentralzation strategy in developing energy production units based on renewable energy sources, but for a centralizing strategy in the electricity system operation based on creation regional Operation centers throughout the Europe.

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Hydrogen as an energy carrier for fuel cell Systems. Environmental consequences for using Hydrogen as a secondary energy carrier

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Abstract. *Hydrogen (H_2) as a secondary energy carrier is one of the promising solution for energy conversion applications in the future. Fuel cells (FC) as chemical conversion systems which are driven with H_2 can increase the overall efficiency of energy conversion, reducing greenhouse gas emissions and the possible dependencies of fossil energy sources in the future. This article shows the dependencies between the primary energy sources and FC applications. The aim of the scientific paper is to show the possible consequences of the environmental impact using H_2. Three aspects are looked more in details. First aspect is the transforming process for producing environmental friendly H_2 with comparable energy prices. Second aspect are the FC applications and there potential increasing efficiency and reducing harmful fuels. The third aspect is the environmental impact of using H_2 for such energy conversion processes. Thermodynamic and chemical dependencies are crucial. Methodologically a model is used to show the different dependency of this energy conversion processes. Parameter like efficiency of the primary energy conversion process, efficiency of the FC system, will be considered. The result of the research shows the crucial aspects to use H_2 as a secondary energy carrier. The statements made in this article can help stakeholder around H_2 and energy conversion processes.*

Keywords: Renewable energy, hydrogen, fuel cells, energy conversion, well to wheel, environmental impact

Introduction

Today's energy conversion processes with fossil fuels substantially contribute to global warming and climate changes (Stern, 2014; Le Quere, 2014). To reduce the man-made anthropogenic greenhouse gases, new ideas and concepts for energy conversion systems are required (Ranger, 2012; Rogelj, 2011). One solution is using H_2 as a secondary energy carrier *produced* out of a *renewable energy source (RES)* (Quaschning, 2016; Töpler, 2014). Sustainable H_2 production could be a future strategy for a H_2 economy. Decentralized high efficient energy conversion systems driven with locally produced H_2 can be one key energy strategy in the future. Stationary and mobile application with FC driven with H_2 fuel produced out of RES will help moving in a sustainable (permanence) energy future.

Scientific aspects

First aspect: transforming process for producing environmental friendly H2 To analyze and understand how energy is converted the different energy sources like primary, secondary, final and usable energy terms must be defined (Allelein, 2011; Dieckmann 2014). Tables 1-2 show the different ways for producing H_2 today (Machhammer 2015, Dincer, 2016; Fang, 2017; Kirilin, 2014). Today's H_2 production is mostly done through fossil energy sources in the chemical industry.

Table 1. *Today's H_2 production with fossil energy sources*

Process	Fuel Type	Efficiency	Cost €/kW	CO2 impact
Auto thermal reformer (methanol reforming)	CH_4	< 80 %	> 0,04	Huge impact
Partial Oxidation (oil gasification)	Fossil oil	< 80%	> 0,05	Huge impact
Kvaerner process	Fossil energy	< 48% H_2, Ca. 10% thermal Energy < 40 % C	> 0,05	Little impact
Electrolyser fossil energy	Fossil energy	< 70 %	> 0,08	Huge impact

Source: Authors' own design based on industry estimates.

Table 2. *Today's H_2 production with a renewable energy source*

Process	Fuel Type	Efficiency	Cost €/kW	CO2 impact
Steam reformer	Biomass	Max 80%	> 0,05	Carbon neutral
Electrolyser Hydropower, Wind, PV	electricity	Max 60%-80%	> 0,08 > 0,09, > 0,20	No impact

Source: Authors' own design based on industry estimates.

`Second aspect: that is analysed is the FC applications, efficiency and environmental impact FC is a device for converting chemical energy in electricity and heat (cold burning process) with an efficiency of over 80% (Niederhausen, 2014; Kurzweil, 2013).

*By chemical principle of a polymer Electrolytic FC (PEM) t*he entire chemical reaction in PEM FC can be described by the equation:

$$2H_{2\,(gas)} + O_{2\,(gas)} \rightarrow 2H_2O_{\,(liquid)} \qquad [1]$$

Depending of the different applications, different *FC types* are available (Staiger, 2016).

The third aspect: for the analyses is the environmental impact of using H_2 with fuel cell systems The most common element in the universe represents about 90% of all atoms, approximately ¾ of the total mass. Atomic H reacts with organic compounds

(Carbone element C) to form complex mixtures of different products (Methane CH_4, Petrol C_6 H_{12}).The stoichiometry is based on the conservation of mass. This may be determined as the amount of CO_2, which is produced during the combustion of various fuels.

Methodology

For the EECM with H_2 (Figure 1), the following parameters for calculation purpose and comparisons are essential for the process: efficiency of the primary energy conversion, type of primary energy sources, type of FC application with efficiency parameter.

Efficiency $\eta_{h2} = \frac{\sum Q_{out}}{\sum Q_{input}}$ $\eta = \frac{\dot{Q}_{out}}{\dot{Q}_{input}}$ [2]

Total efficiency $\eta_{total} = (1-\eta_1) * (1-\eta_2) * (1-\eta_3) * (1-\eta_4) * \eta_{sink}$ [3]

$\eta_{total} = \frac{Q_{out}}{Q_{primary}}$ [4]

Total Environmental Impact (TEI) $TEI = Q_{primary} * CO2cf$ [5]

PEF= Primary Energy Factor, $CO2cf$ *= CO2 conversion factor, TEI= Total Environmental Impact*

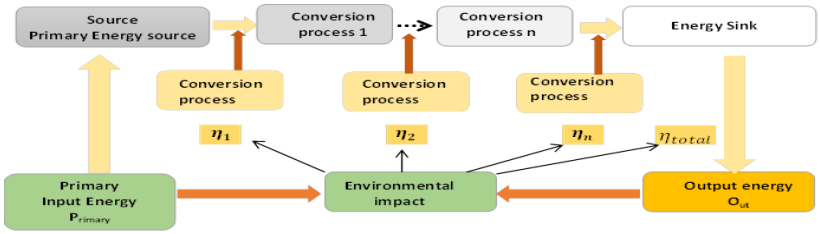

Figure 1. **Environmental Energy Conversion Model (EECM)**
Source: Authors' own design.

Research Analysis and Results

For this article one example for a mobile and one for stationary system is used.

Stationary system with Fuel Cell Heating systems Alternative heating appliances with an integrated chemical energy converter" (Fuel Cell, Cold burning process) which operates with H2 is far more efficient as a Carnot cycle system. Today's FCH Systems are using fossil gas for operation. To operate the FC, H2 is necessary. For this reason, a reformer is used to generate the H2 part out of a fossil fuel like CH4. Today's FCH on top of the FCH System a condensing gas boiler is integrated.

Reforming process and environmental impact today The amount of CO_2 of the reforming process can be calculated with the chemical stoichiometry. Molecular mass equation: *16g+ 36g = 8g + 44g* → *1kg* H_2 → *5.5kg* CO_2 With the energy contents of 33.33 kWh/kg H_2, 166 g CO_2 /kWh *will be generated.*

Mobil System Electrical cars in compare to conventional are far more efficient. A normal combustion engine car has efficiency (tank to wheel) of less than 25%. (Schreiner, 2015; Cornel, 2015; Tschöke, 2015) Electrical cars in compare have an efficiency of ca. 80%. The problem in present is the battery system, maximum driving distance and economics.

Fuel Cell cars The principal of a FC car is similar like an electrical vehicle. Instead of a battery a tank with H_2 provide the energy for the car. The efficiency (tank to wheel) is less than an electrical car. In compare to an electrical vehicle the efficiency is ca. 45% (Cornel, 2015).

Environmental chain for FC heating systems and for mobility application

*The reference is a 50 kW petrol car. T*he car needs 15 kWh energy for 100 km

The Chain Well to Tank takes all energy production steps into account. The result shows, electrical cars with batteries charging with a RES (PV) have the best environmental impact. FC driven cars with H_2 produced out of a fossil energy source (electrolysis electricity) has the worst environmental impact. If H_2 are produced out of a RES the environmental impact would be 30 times less.

For the Chain Well to Wheel the total chain from production to the energy output on the wheels

Chain 1 = efficiency appliances (car), chain 2 = H_2 compression 700 bar, Chain 3 = electrolysis, Chain 4 = energy conversion electricity (generators, distribution loses), chain 5= primary energy factor 1,2.

Table 3. *Energy Chain from Well to Wheel as an example for Petrol and fuel cell car*

Type	Fuel type	Cain 1 Car %	Chain 2 %	Chain 3 %	Chain 4 %	Chain 5 %	Total %
Car petrol	Petrol	20 %				80 %	16 %
Car with batteries	PV	80 %			15 %		12 %
Car with fuel cell	PV	45 %	90 % Compression.	70 % electrolysis	15 %		5 %

Source: Authors' own processing.

Table 4. *Energy Chain from Well to Wheel as an example for different fuel types range 100 km*

Application	CO_2 impact kg/kWh	Energy amount on the wheel	Total efficiency	Total primary energy	CO_2 kg Primary Energy	CO_2 gr per km
Reference system						
Car with Petrol	0,287	15 kWh	16 %	93 kWh	26kg	260 gr
Alternatives						
Car with batteries Coal	0,7	15 kWh	22 %	68 kWh	47 kg	470 gr
Car with batteries PV	0,01	15 kWh	12 %	125 kWh	1,25kg	12 gr
Car with fuel cell fossil	0,57	15 kWh	8 %	187 kWh	106 kg	1060 gr
Car with fuel cell PV	0,01	15 kWh	5 %	300 kWh	3 kg	30 gr

Source: Authors' own processing.

Example FC heating system with 12kW power reference condensing gas boiler

The case study is following the parameters: *Energy demands 20.000 kWh/a, electricity 4.000 kWh, location Germany*. The result shows, that conventional condensing gas boiler and electricity from the grid has the worst environmental impact. The reason is the bad efficiency of the production of electricity. In the Micro CHP´s the efficiency chain is far better for producing electricity. Ideal situation would be a H_2 driven FCH System where H_2 is produced out of a RES source.

Table 5. *CO_2 Impact Primary Energy usage*

Type	Efficiency unit	Efficiency chain 2-5	Total unit energy kW	Total Primary energy kW/a	CO2 equiv. kgCO_2/kW	CO_2 kg/a
Reference System						
gas	0,98	80 %	20.400	25.500	0,24	6.120
electricity		35 %	4.000	11.428	0,56	6.400
Total CO_2 emission /a						***12.520***
Fuel Cell Heating System with fossil gas						
FCH with fossil gas 1 kw el. 0.8 kw thermal	0,70	80 %	28.570	35.700	0,24	8.568
	45% el.	100 %	4.000			
	35% th.		3.200 rest gas 19.022			
Total CO2 emission /a						***8.568***
Fuel Cell Heating System with H_2 produced from fossil gas						
FCH with fossil H_2 1 kw el. 0.8 kw thermal	0,9	50 %	22.222	44.000	0,24	10.580
	45% el.		4.000			
	35% th.		3.200 rest gas 19.022			
Total CO2 emission /a						***10.580***
Fuel Cell Heating System with H_2 produced from renewable source PV						
FCH with PV H_2 1 kw el. 0.8 kw thermal	0,90	10 %	22.222	222.222	0,01	2.222
	45% el.		4.000			
	35% th.		3.200 rest gas 19.022			
Total CO2 emission /a						***2.222***

Source: Authors' own processing.

Conclusion

The scientific research shows that H_2 as a secondary energy fuel have a huge impact, under which conditions hydrogen will be produced and processed. Main aspects are: r*educing the environmental impact/decarbonisation, independency on energy/storage possibilities/ decentralization, reducing energy cost, transmitting losses, high efficient energy conversion system with new product and new business model and sustainable form of a new energy economic future.*

The research shows that H_2 must be produced out of a renewable primary energy source. FC will be a key technology in the transformation of H_2 to other forms of energy. In compare to existing conversion processes (Carnot Cycle) FC are far more efficient. Energy conversion should be designed in decentralized units. The energy transformation should take place directly at the consumer where the energy is needed. The efficiency of the energy "value chain" plays an important role (RES availability example PV).

In the mobility sector (Cars) the energy source for charging up batteries or producing H_2 must come from a RES. Fossil driven sources would make the environmental impact even worse. Up to 95 % CO_2 reduction with a RES is possible. If you count the amount of cars which are available, the environmental impact in a long term is huge.

For stationary system like in our example a FC heating System, it would improve also with a fossil energy source the environmental impact. Ideally the fuel should be produced as well out of a RES. 80 % CO_2 reduction would be possible.

In the mobility and heating sector where more than 60% of the energy demand is used, the energy saving potential and increasing efficiency potential is enormous.

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Risk management method for small photovoltaic plants

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Abstract. *Risk management is necessary for achieving the goals of the organization. There are companies that use it but even still it is not a priority in many of them. There are some good practices in the energetics field for minimizing risk but they offer only partial risk prevention and are not sufficient. Companies working in this field still fall in risk situations and take damages when they occur. Therefore a new risk management method needs to be presented. Renewable energy sources are much needed in the current state of environmental pollution and close completion of fossils. Small photovoltaic plants offer plenty of advantages to the other renewable energy sources which prioritize their risk management. The laws in European countries have safety regulations for the staff, participating in the construction and maintenance of the photovoltaic systems, but these measures are not sufficient – there are still risks that occur and damages that take place. Investors in small photovoltaic systems need to know what are the existing risks that could influence their systems. There are plenty of various risk situations which could take place. If they occur, this will lead to extra expenses on behalf of the investor which will have a financial influence on the payback of the investment. The purpose of this work is to present a risk management method, which currently does not exist in the country, so that the risks and the damages from them that could occur during the exploitation of small photovoltaic plants could be identified, measured and explained.*

Keywords: risk, management, method, small photovoltaic installations, experts, interviews

Introduction

Risk management is necessary for every organization, even for small enterprises, and especially for them, because lower damages could have a much higher impact on them rather than on large corporations. In order for every business to achieve its goals, the risks that could influence them need to be established, identified, evaluated and controlled, i.e. they are to be managed well in order to ensure the success of the organization and the profit. When considering the energy field in particular, it can be concluded that there are some good practiced to reduce risk like technical requirements related to the installation of the systems or to be observed by the staff working on it.

However, risks do occur which means that the existing risk management options are not sufficient. For example, environmental risks could pose a threat to the systems – not being able to precisely predict the weather conditions will prevent the investors in making plans for their profit for the upcoming year. Photovoltaic installations have plenty of advantages to other energy sources, discussed in detail in (Velikova, 2012). Some of them are – they do not emit substances that could harm the atmosphere, they cannot cause natural catastrophes like nuclear power plants could, they do not pollute the soil or the water, they use a source which will not end in million years to come – the sun, and this source is openly available to everyone.

Small photovoltaic installations have some specific positive sides – they are cheaper than large systems which means that more people are able to afford them and use them. Installing a photovoltaic system with the purpose of using its production for private consumption only is easier and simpler compared to installing such a system with the purpose to connect it to the grid, in Bulgaria. That is why creating a risk management method for small photovoltaic installations has a priority compared to other sizes and types of renewable energy sources. The first steps of this method are presented in (Velikova and Kirova, 2014). This material presents a method for risk management for the exploitation of small photovoltaic installations. This research is based on a previous one with data for an actual installation, as already mentioned.

Literature review

The need for environmental preservation, ensuring availability of energy sources, the growing dependence between environment and economic development make risk management in the environmental sector an economic and social priority. Photovoltaic installations have plenty of advantages as mentioned above. There are plenty of methods and approaches for risk evaluation (Vladimirov, 2009) which makes it difficult and time consuming to choose one and define it as an appropriate one. Some methods are used more widely than others, of course, this making the task to choose an appropriate method or approach a bit easier (Mitev, 2007) considering this fact. Many organizations that engage in risk management use subjective classification which defines the probability for risk occurrence as belonging to one of three categories – low, average and high (Hubbard, 2007). What is low, average or high will depend on the factors which are different for the different companies like size, purpose of the enterprise, thought pattern of the decision maker, etc. This means that different investors will consider risks differently based on their way of thinking and how they see risk. That is why specific strategies and a risk management plan cannot be offered – this is a decision that has to be taken individually. Many companies use this method for risk management but it does not provide specific numbers related to the consequences of the probable risks. Therefore, using a definition for the risks – low, average or high is not sufficient for a successful risk management.

Research methodology

The object of the research is chosen after analysis of the different types of RES – small photovoltaic installations with total installed power of up to 200 kWp. This risk management method is approbated and the success of its application is already proven which makes it appropriate to use by others. Since it is a new type of research that applies to a comparatively new field in Bulgaria we are yet to see the results of its application and how successful it will actually prove to be. It will take time to see if the information given by experts will be confirmed in reality and currently their data cannot be précised more.

Method of research

There is a large variety of methods and approaches for risk management which makes it almost impossible for all of them to be collected, reviewed and presented in detail. Of course, some of them are more popular than others. The success of the experiment largely depends on its overall organization and implementation. The method and the first steps of the structure of the work are available and justified in (Velikova and Kirova, 2014) which sets the basic information for the research. For the current research the information provided before is now being updated, renewed and specified. Currently, the steps already existing are developed more and a few more steps are added to the list to make it fuller and complete.

Choice of research approach

The expert evaluation is based on the use of the abilities of experts to give an evaluation which is closest to reality. There are often many experts in different areas that have knowledge regarding certain issues and therefore they can be asked to provide it in this case. This approach has many advantages. Experts are called specialists that have wide and close to reality knowledge, experience and understanding which can be used to give answers to important questions. Those answers are anonymous which gives a more relaxed atmosphere for work of the experts. The opinions that they have are collected with their permission and understanding of the research. The method has also some disadvantages but they are minor to the positive sides of the approach chosen. The experts will be asked to give their opinions on the problem of interest. Each expert will be chosen anonymously and will not have information for the other participants of the research. The interviewer is to stay neutral when asking questions and should not direct the questions towards a specific answer. The interviewer should not provide information to the expert that could lead to distorted results like suggestions, specifications, precise values, etc. It is expected that some ranges of damages could have a 0 for a minimum value if the experts have little or no experience related to them. The experts chosen should be well informed about the research, they should be aware of the purpose of the research and the way the information from them will be used. This preliminary information is necessary in order to ensure that the opinions given are as close to reality as possible and will correspond to the purpose of the research.

Profiling the experts

The specialists need to be able to give accurate and present-day information because the sector develops rapidly and the risks also change because of it. As new technologies appear, new risks, related to them emerge as well. In order to ensure objective selection

of the specialists who will take part in the research the people selected need to have as much experience and knowledge of the topic of interest as possible. Those experts need to work on the territory of the country so that they could present relevant data for the research for Bulgaria and so that they have the necessary education, experience, knowledge and abilities that will allow for best results. This would guarantee their competence in their work and would provide data that is closest to reality. At the same time the literature provides some tendencies when compiling the experts' profile and they are complied with in the research. Each expert is to be interviewed alone, in a time that fits their schedule so that they could not be pressed to give fast answers. The specialists should feel comfortable and have the conditions needed so that the answers given are by people in the appropriate state of mind.

Compiling interview questions

The information searched for will be for small photovoltaic installations. It has to respond to the requirements of the method which will be used to collect more information regarding the risks of the system. The data has to be clear, full, precise and understandable so that the method could be applied, and it should also respond to the restrictions set. The questions and risks included in the research can be found in their base version in (Velikova and Kirova, 2014). Since then they are updated and enriched. The analysis of the risks is made based on literature review. There are various sources defining risks for small photovoltaic systems. None of them though offers full and complete information. All sources are partial and give a small part of information. In this case the expert data could have a role in stating those risks.

Organization and conducting the research

There are various ways to obtain the information needed to conduct the research. In this case the experts will be selected using a documental approach randomly. They only need to comply with the conditions for competence that are set above. Solely this will guarantee a quality of the research as specialist in this method recommend. The research will be conducted in a time that is convenient for the experts to be contacted, consulted with and interviewed. Their availability will define the timespan of the work.

Processing and analysis of results

The expert interviews will give a more precise and therefore – useful information related to the risks for small photovoltaic systems based on collected and analyzed data in ways, explained in the method. After the end of the interviews, the information has to be processed in a way that allows its use afterwards. The form and content of the answers will be adapted to the necessary method for their calculation.

Conclusion

There are some good examples for partial risk prevention in the energetics field which means that other approaches need to be searched for. An algorithm, based on which expert interviews are developed and implemented, and a definition of the specialists to participate in the research is created. The method of the research is presented and justified. It can be used to obtain data related to damages from probable risks to which small photovoltaic systems are exposed. The method described in this article is implemented and approbated by using the data provided by the means given in the text.

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Management of secondary energy resources (SER) in industry

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Abstract. *In today's context of sustainable development the problem of natural resources is very important for energy and environment policies of most of the countries. The humanity is confronting with depleting of natural resources, food, water, conventional energy resources (oil, natural gas and coal) and with climate change issues. As a response to the above mentioned issues it can be seen an intensification of efforts towards diminishing the climate change that is due to greenhouse gasses emissions from conventional fuels combustion. In this respect today's actions are directed towards development of clean industrial technologies. Together with development of technologies for renewable energy resources, recuperation of all forms of secondary energy resources represent the most efficient energy solution. Today, different industrial processes lead to substantial energy losses especially when talking about flue gasses (which are available from any combustion process) and they represent about 70 % from all secondary energy resources. The main causes of appearance of these energy losses are due to technological and energy imperfections of industrial processes, but there are also causes due to equipment condition and its utilisation.*

Keywords: energy efficiency, management, secondary energy resources, recuperation

General aspects

In today's context of sustainable development the problem of natural resources is very important for energy and environment policies of most of the countries. The humanity is confronting with depleting of natural resources, food, water, conventional energy resources (oil, natural gas and coal) and with climate change issues.

As a response to the above mentioned issues it can be seen an intensification of efforts towards diminishing the climate change that is due to greenhouse gasses emissions from conventional fuels combustion. In this respect today's actions are directed towards development of clean industrial technologies. Together with development of technologies for renewable energy resources, recuperation of all forms of secondary energy resources represent the most efficient energy solution.

Today, different industrial processes lead to substantial energy losses especially when talking about flue gasses (which are available from any combustion process) and they represent about 70 % from all secondary energy resources. The main causes of appearance of these energy losses are due to technological and energy imperfections of industrial processes, but there are also causes due to equipment condition and its utilisation. In these conditions recuperation of energy potential from the secondary energy resources can lead to increasing productivity, thus leading to increasing energy efficiency and reducing direct and indirect environmental impact.

Definition of secondary energy resources

Secondary Energy Resources (SER) represent "energy losses" from different industrial processes. The energy level/potential of a secondary energy resource is like an "energy barometer" of the industrial process that it comes from. The higher the energy content of the SER (under different forms) the lower the energy efficiency of the analysed processes.

The analysis of (energy and economic) efficiency of recuperation of secondary energy resources within a technological industrial process is performed at a certain moment characterised by technological and economic conditions. Depending on these conditions there can be only recuperated a part of the SER potential due to the technical and economic restrictions. This part of SER that can be recuperated at a certain moment represent the Reusable Energy Resources (RER), [1].

Thus, the energy value of RER is depended on the development of energy recuperation technologies and on the reference level of energy costs, which are dynamic in time.

The great diversity of industrial processes leads to different categories of SER, with different characteristics depending on the form of used energy and on the type of energy carrier.

Depending on the physical and chemical characteristics SER from different industrial processes can be classified based on the energy vector. Table 1 shows the classification of secondary energy resources that come from industrial processes.

Actual technological development takes place based on a policy of continuous technological modernisation of industrial processes and on a permanent increase of concern for rational use of energy, thus for increasing energy efficiency.

Utilisation of solutions for recuperation of energy from SER that come from an industrial process is one of the main measures for increasing energy efficiency, which leads to good economic results and to decreasing the environmental impact.

Table 1. *Examples of secondary energy resources*

SER type	Energy vector contained	Example of SER from industrial processes
Thermal SER	Sensible and/or latent heat	- Flue gasses from combustion processes from different industrial sectors: metallurgy, construction materials, petrochemical, etc. - Hot technological wastes (slag, coke). - Used steam from pneumatic machines. - Humid air evacuated from industrial halls and drying equipment.
Combustion SER	Chemical energy	- Flue gasses with a calorific value resulted from petrochemical and metallurgical processes (kiln, ovens, refineries, coal gasification, etc.). - Lye from pulp and paper industry. - Wood wastes (wood processing industry).
Pressure SER	Pressure	- Kiln gasses (metallurgy). - Solutions of fluids under pressure from technological equipment (steam, compressed air).

Source: Authors' own classification based on the industrial process.

Possible directions of recuperation of SER

Recuperation of SER can be performed within the analysed industrial process (internal recuperation) or outside the analysed industrial process (external recuperation).

Internal recuperation is performed when the energy of SER from an industrial process is recuperated within the same process, e.g. combustion air pre-heating, fuel pre-heating, technological materials pre-heating, etc.

External recuperation is performed when the energy of SER from an industrial process is recuperated outside the process for covering other power or heat demands.

Complex recuperation represents the combination of internal and external recuperations with the aim of increasing the total recuperation ratio. The combination of recuperation solutions can be done through sequence or parallel integration of simple recuperation solutions. The complexity of recuperation schemes increases with number of analysed solutions. From the energy point of view, by combining internal and external recuperations there can be obtained a higher recuperation ratio compared to simple recuperation solution. However, it should be mentioned that the decision of utilisation of a certain recuperation solution is taken always based of economic efficiency of the analysed contour.

In these conditions the analysis of efficiency of recuperation is performed for the entire recuperation scheme aiming at determining the optimal solution from the economic point of view, [2].

Management of secondary energy resources

The activities of an energy manager performed within an industrial contour include also the management of secondary energy resources. This type of activity has direct effects upon increasing energy efficiency of the entire company. Monitoring of energy losses, reduction of energy losses through different energy efficiency measures, inventory of SER, energy content analysis of SER, establishing the ways and solutions of energy recuperation from SER, energy, economic and environmental analyses of different schemes of recuperation are performed in multiple steps. Bellow there are detailed the main steps/phases of such an analysis.

1. There is established the industrial contour that is analysed from the energy point of view (energy efficiency). This contour can be a part of technological equipment

(for example combustion chamber of a kiln), technological equipment (including or excluding recuperation equipment), a set of technological equipment, a technological line, a company, an industrial platform.

2. There are analysed from the energy point of view the processes within the considered contour – based on the energy and exergy balances, determining energy losses.

3. There are applied specific measures for reducing energy losses, taking into consideration technical and economical profitability (for avoiding recuperation of certain energy losses that can be excluded or diminished through a lower economic effort than through their recuperation).

4. For the specified contour and the new energy losses there are established energy flows, an energy analysis (quantitative and qualitative) is performed of each energy flow, compared to the reference conditions of the environment, and thus, resulting the limits of the thermodynamic nature.

5. There are established the directions of recuperation and simple (punctual) solutions for every energy flow recuperation taking into consideration the energy content and energy form, and on the other hand taking into account the energy demands of the analysed contour, and their variations, thus resulting the load limitations.

6. There are established types of recuperation equipment, including their main technical characteristics, thus, leading to technical limitations.

7. There is performed a technical, economic and environmental analysis of the efficiency of SER recuperation, taking into consideration energy savings (fuel) obtained through recuperation, this criterion defining the energy efficiency of recuperation.

From the economic point of view fuel savings obtained through recuperation is reflected in the financial savings with fuel. The economic analysis also takes into account investments and expenses associated to recuperation equipment, and eventually, supplementary fuel consumption of recuperation equipment. The economic criterion used in this case is the payback period

The environmental effect of recuperation of secondary energy resources can be quantified through eco-taxes paid (they are included in the cash flow of the economic analysis) in case of exceeding the limits of pollutant emissions.

8. Based on the complex analysis: energy, economic and environmental there are established direction, solution and optimal ratio of recuperation of secondary energy resources, setting at the same time the value of RER.

Table 2 shows the main energy efficiency criteria:

Table 2. *Energy efficiency criteria*

Fuel savings - absolute value - relative value	$\Delta B=\Delta W/H_i$[kg fuel/τ] $\Delta b = \Delta B/B_i$
Recuperation ratio	$\delta = W_{rer} / W_{res}$

Source: Authors' own design.

Where: ΔW represents the fuel savings due to application of recuperation solution, kJ/τ; Hi – lower heating value of saved fuel, kj/kg fuel or fuel equivalent, kj/kgc.c); τ – reference period for calculus; Bi – initial fuel consumption before implementing recuperation solution; Wres – energy content of SER, kJ/τ; Wrer – energy recuperated from SER, kJ/τ, [3].

Case study

In the presented case study there is analysed a complex scheme of internal recuperation of heat from flue gasses resulted from a combustion chamber of a kiln for thermal treatment. The recuperation solution aims at pre-heating the combustion air in sequence with pre-heating technological materials. Figure 1 shows the simplified scheme of a complex recuperation.

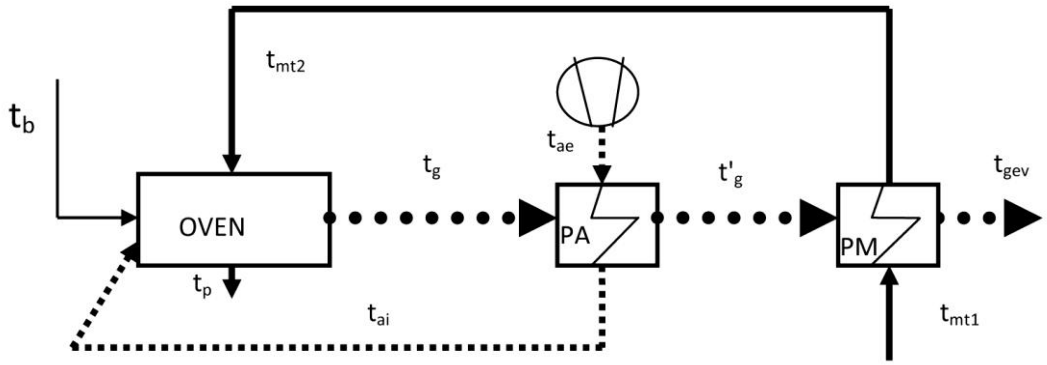

Figure 1. **Simplified scheme of a complex recuperation of heat from flue gasses**

Source: Authors' design.

Notations:

PA – air pre-heater;

PM – Materials pre-heater;

t_{ae}, t_{ai} – temperature of cold, respectively pre-heated air;

t_g, t'_g, t_{gev} – temperature of flue gasses at exiting the combustion chamber before recuperation, after air pre-heating, respectively after materials pre-heating;

t_p – temperature of final products;

t_b – fuel temperature at kiln entrance;

t_{mt1}, t_{mt2} – temperature of technological materials at entrance in combustion chamber, respectively after heat recuperation.

Energy efficiency of recuperation can be determined based on total fuel savings given by:

$$\Delta B_{PA-PM}=\Delta B_{PA}+\Delta B_{PM} \ [m^3_N/s]. \ (1)$$

The total recuperation ratio of heat from flue gasses is:

$$\delta_{r,PA-PM}=\delta_{r,PA}+\delta_{r,PM} \ [\%].(2)$$

Economic efficiency of the complex recuperation is established taking into account the value of fuel savings ΔBPA-PM obtained through investments and a surplus of annual expenses due to additional equipment for recuperation.

The investment is given by:

$$I_{ef} = I_{PA}+I_{PM}+I_{VG}+I_{VA} \ [Euro], \ (4)$$

Where:

IPA – investment for air pre-heater;

IPM – investment for materials pre-heater;

IVA – investment for air fan;

IVG – investment for flue gasses fan.

The economic effect of the analysed solution is determined based on the investment payback period:

$$TR = \frac{I}{\Delta C} \quad (5)$$

Where:

ΔC – represents expenses savings due to fuel savings.

Environmental efficiency of heat recuperation from flue gasses can be established by determining the environmental impact criteria: greenhouse effect, acidification, photo-oxidant pollution, contribution to depletion of natural reserves and raw materials. These criteria allow quantification of environmental effects of recuperation of secondary energy resources.

Taking into consideration the environmental effect of recuperation, the economic criterion of payback period can be thus written, where ΔEc represents savings due to eco-taxes:

$$TR = \frac{I}{\Delta C + \Delta Ec}, \quad (6)$$

The main results of the case study are presented in table 3.

Table 3. *Main energy criteria for proposed recuperation solutions*

Energy criterion	Air pre-heater (PA)	Materials pre-heater (PM)	Combined recuperation (PA+PM)
Annual fuel savings [m^3_N/an]	409000	471000	564600
Net fuel savings – relative value [%]	15.64	17.28	21
Recuperation ratio	0.33	0.35	0.72

Source: Authors' own findings.

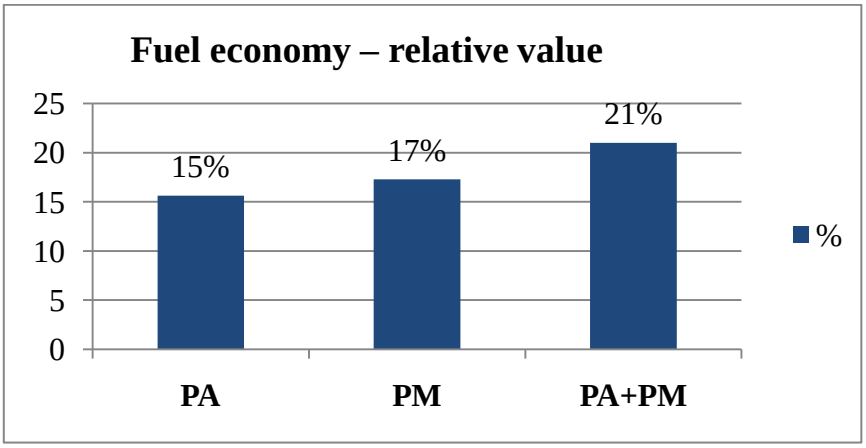

Figure 2. **Variation of fuel savings**

Source: Authors' own findings.

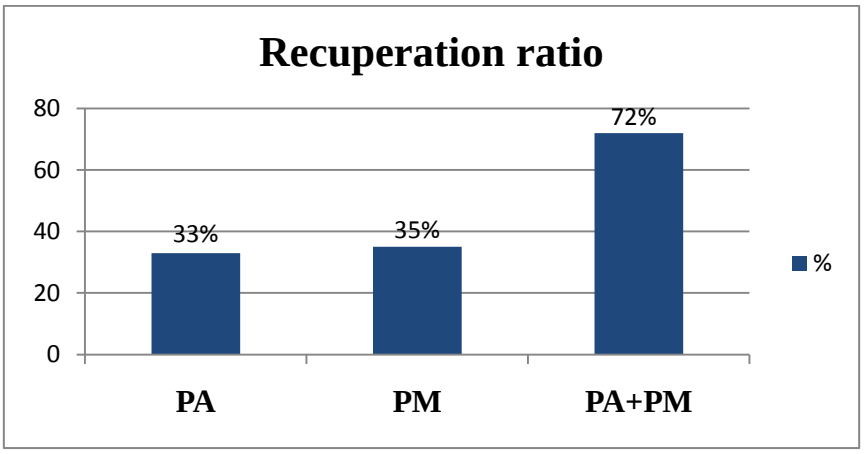

Figure 3. **Variation of fuel savings**
Source: Authors' own findings.

Calculus of payback period:

- Without eco-taxes:

$$T_f = \frac{Ief}{\Delta C} = \frac{302200}{137364} = 2.2[years], \quad (7)$$

- With eco-taxes (on sulphurous):

ΔEc = Δ SO2* 600 [Euro]=22.89*600=13736 [Euro/year]; pt SO2=600 [Euro/tSO2]

$$T_{f*} = \frac{I_{ef}}{\Delta C + \Delta Ec} = \frac{302200}{(137364 + 13736)} = 2 \text{ [years]}, \quad (8)$$

Figure 4 shows the variation of payback period depending of the recuperation solution.

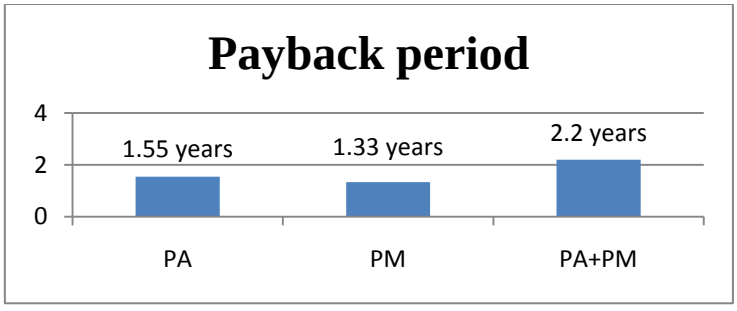

Figure 4. **Payback period for each analysed solution**
Source: Authors' own findings.

Conclusions

From the economic point of view, even though the complex recuperation solution is more efficient from technical point of view, the complex recuperation solution leads to greater payback period compared to simple solution. This is due to

that fact that the investment for the complex solution is higher due to the two pre-heaters (PA and PM) compared to separate solutions, and this fact leads to increasing payback period, even though it is not a great increase and the payback period of the complex solution is acceptable from the economic point of view.

It can also be noticed that the eco-tax influences the economic efficiency of the complex recuperation solution, leading to reducing payback period compared to situation when eco-tax has not been taken into consideration.

The final decision regarding choosing the recuperation solution is taken after a detailed analysis including analysis of technical and economic criteria, and taken into account the environmental impact.

After analysing all energy, economic and environmental criteria for all recuperation solutions taken into consideration compared with reference solution with no recuperation, there can be drawn the following conclusions:

Valorisation of secondary energy resources, in this case the heat potential of flue gasses, represents one of the most efficient methods for increasing energy efficiency, leading to substantial reduction of primary energy consumption. This is the main argument for implementing SER recuperation solutions in different industrial sectors. The complex SER recuperation solutions lead to increasing energy efficiency.

SER recuperation also leads to reducing environmental impact, directly and indirectly, through reducing pollutant emissions due to fossil fuel savings.

The optimal SER recuperation solution is determined after a complex energy, economic and environmental analysis.

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Electricity Market Auction Settings - A Comparison between Marginal Pricing System (MPS) and Pay-as-Bid (PAB) for the Romanian Market

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Abstract. *Renewable energy sources developed significantly in the last 5 years in Romania, fundamentally changing the power market on both available capacity and production predictability. Several changes in primary and secondary legislation on the wholesale power market led to oversupply on OPCOM – Romanian centralized day-ahead platform - during windy days or summer peak hours. The Marginal Price mechanism on day-ahead market decreases prices in those hours, below baseload generators variable cost, leading to commercial losses for them, or even more than this, to the inability to secure long term investments in baseload generation capacity to replenish the existing ones. Under these circumstances, the present paper examines the potential of other price mechanisms for OPCOM's day-ahead auction – like pay-as-bid – in order to achieve both the short and the long term goal of economic efficiency in power generation systems. The methodology is based on testing two pay-as-bid hypotheses under 2 situations: the ideal one - perfectly know market information - where all participants can determine the market closing price, and the real one where the market information is known with a certain error. The results indicate that switching from a marginal price system to pay-as-bid pricing will disrupt the short term economic efficiency and will not create the investment incentives for long term power generation capacity. Thus, a different new mechanism needs to be developed or an adjustment to the existing one needs to be achieved in order to secure the economic efficiency in the Romanian power generation system.*

Keywords: electricity, renewables, power generation, power market, day-ahead auction, marginal price, economic efficiency

Introduction

Romanian electricity prices have been falling. Over the last 4 years, average electricity prices in the Romania have decreased by one major change: an oversupplied market by newly installed renewable capacity under current electricity trading rules.

Renewable energy sources developed significantly since the green certificates support scheme has been establish, leading to steep development of the wind installed capacities from almost zero to near 3,000 MWh at the end of 2015. In a context of less than 10,000 MW hourly peak demand, the wind installed capacity fundamentally changed the power market on both available capacity and production predictability.

In 2012, a new Energy Law creates the obligation to an energy producer (Generator) to sell its entire production only on OPCOM (Romania's energy centralized market operator) centralized platforms, ether on forwards market, via bilateral contracts platform, or on spot market, trough day-ahead or intra-day platforms. This provision prohibits any bilateral contracts negotiated directly between parties, including the flexibility provided by the possibility to negotiate a specific contract to properly fit a particular energy deal between two parties. Obligation to sell on OPCOM's centralized platform for bilateral contracts, using standard contracts and products, together with ANRE's – the Romanian national regulatory body – secondary legislation on bilateral contracts that requires 'fix quantities and prices' led to the situation where renewables power plants cannot sell unpredictable production via fix quantities products of the forward centralized platform.

For any unpredictable power producer, and this covers almost all types of renewable capacity: wind, solar, hydro on river, the only remaining market is the spot one, where they can sell day-ahead or intra-day their hourly production. The OPCOM day-ahead auction mechanism is based on marginal pricing, the hourly market clearing price setting the price for the respective hour. Constraining almost 5,000 MW renewables installed capacity on spot market with an average demand of less than 3,500 MW per each hour, under a marginal pricing system, leads to oversupplied situations that trigger a low market clearing price. A low energy price, otherwise good for all consumers, is setting a wrong market signal as, in this particular case of oversupply, the price does not reflect the real market equilibrium, but rather a regulatory constrain of certain market players.

This article is analyzing the advantages and disadvantages of switching the day-ahead marginal pricing system to a pay-as-bid one as a solution for spot energy market to allow different settling price for different generators, assuring the long term investment recovery for each one of power generation technologies. The difference between marginal pricing and pay-as-bid system was summarized in different previous researches by 2 hypotheses, explained in details in the section *Price formation on pay as bid auctions.*

Question of which one of those two pricing mechanisms is the most appropriate one has been raised around the globe in all liberalized energy markets, but in a complete different situation. In undersupplied situations, the cheapest power plant receive the same price as the most expensive one, shifting the value away from the generation place, as illustrated by Kahn et al. in 2001, "Uniform Pricing or Pay-as-Bid Pricing: A Dilemma for California and Beyond", *The Electricity Journal, July, 2001* and by Susan F. Tierney, Ph.D. and Todd Schatzki, Ph.D. (2008), "Uniform-Pricing versus Pay-

as-Bid in Wholesale Electricity Markets: Does it Make a Difference?", *Analysis Group paper for New York Independent System Operator.*

The effect of the Romanian energy law and ANRE regulation on current spot market prices

Several changes in primary and secondary legislation on wholesale power market led to oversupply on OPCOM during windy days or summer peak hours. The day-ahead market baseload prices have been steadily decreased in the last 5 years when renewables installed capacity, especially wind, increased constantly.

In order to put in evidence the cause-effect relations between wind installed capacity and spot prices, the following method have been used: all OPCOM day-ahead hourly prices during 2011-2015 where collected together with Transelectrica – Romanian national grid operator – hourly energy generation recorded data, per technology, in the same database. The overall situation can be seen in Figure 1.

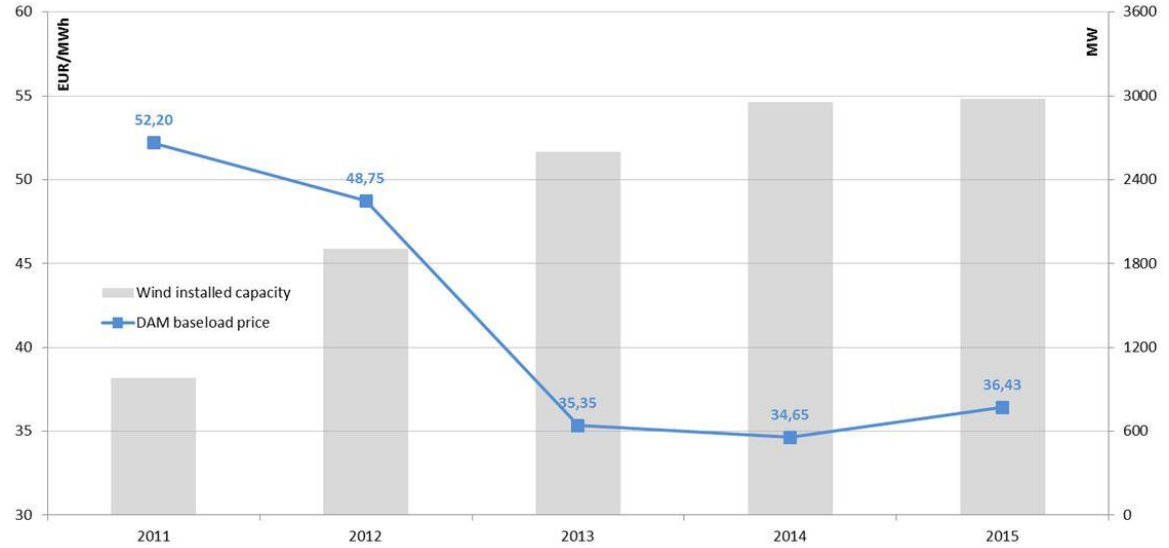

Figure 1. **Day-ahead market (DAM) yearly average baseload price versus Wind Power Plants installed capacity**

Source: Authors' own research results/contribution.

Analysis of the direct wind generation influence on day ahead hourly prices has been computed by selecting the hours when wind generation was equal or higher than 1,000 MW, and recalculate the yearly average day-ahead price for the respective hours. In order to have comparable effect, analysis was limited to year 2014-2015, when installed wind capacity was almost equal. By this method, a 20% spot price negative deviation have been determined when wind production higher than 1/3 of the installed capacity, corresponding to moderate to high wind speeds. The outcome is presented in table 1.

Table 1. *Price and Production deviation when wind production is higher than 1,000 MW per hour*

Year	Price Deviation when Wind is higher than 1,000 MW	Production Deviation when Wind is higher than 1,000 MW
2014	-21%	162%
2015	-19%	119%

Source: Authors' own research results/contribution.

The Marginal Price mechanism on day-ahead market decreases prices in those hours, below baseload generators variable cost, leading to commercial losses for them, or even more than this, to the inability to secure long term investments in baseload generation capacity to replenish the existing ones.

The economic efficiency in power plants dispatch

The goal of the electric industry, even in government-authorized monopoly structures composed of highly regulated utilities, has been to provide reliable power efficiently. The goal of such structures was, in theory, to provide the consumers with energy at the lowest possible price.

Still, we should first define "efficiency", as in the electricity markets it can mean two different types of efficiency. As Mrs. Tierney wrote, "it's important to distinguish between short-run (static) efficiency and long-run (dynamic) efficiency. Static efficiency means: 1) output is produced by the least-cost suppliers; 2) it is consumed by those most willing to pay for it, and; 3) the right amount is produced." ((Tierney and Schatzki, 2008), "Uniform-Pricing versus Pay-as-Bid in Wholesale Electricity Markets: Does it Make a Difference?", *Analysis Group paper for New York Independent System Operator*.).

The short-run efficiency goal is achieved by the principle of economic dispatch – the plants with lower operating costs will be dispatched ahead of those with higher operating costs. Thus this type of efficiency revolves around the operating of existing power resources for any given load. The least-cost dispatch of existing power plants is subject to the limitations of the electricity grid, such as demand-response notice periods or transmission constraints, plant start-up costs or ramping times. Overcoming these limitations depends on the amount of information available to the operators that have to establish the least-costly to most-costly hierarchy and the availability of least-costly plants, but the choice of auction design has almost no influence on such issues.

Short-term efficiency, although offering good solutions for the generating of power through existing resources, is not efficient in generating incentives for the creation of a modern infrastructure, both in terms of generation and transmission. This is where the long-term efficiency comes into play, whose main goal is to create resources, instead of operating them, determining the right amount and type of power generation facilities, their locations, the right infrastructure a.s.o. But these depend on the ability of the existing system to generate the income necessary for investments, to provide a competitive market and to ensure investors of the possibility of investment recovery, given the amount of time and money involved.

The historical means of finding financial resources for investment used to rely on establishing such utility rates for customers that would cover investments, added to all the other components of these rates, needed to cover plant operation or other variable costs.

In a free competitive market such means are replaced by different mechanisms that aim to ensure both the efficient operation of existing power plants and infrastructure, and the financial means for new investments. One such case is the signing of bilateral contracts for the sale of power under market-based rates, for availability to run or through prices that cover more than the cost of production. Also, in centrally administered wholesale markets where compensation in energy markets is tied to being selected to produce power, there are a typically a variety of other means – including some combination of payments for performance in energy, ancillary service and capacity markets.

Starting with the introduction of the Energy Law, bilateral contracts for sales of power under market-based rates where constrain on centralized platform with limited product flexibilities distorting the market mechanism.

Price formation on marginal price system (also called uniformed price auctions)

The uniform price auctions are based on sealed-bid ones, in one bidding round. The system is used in day-ahead auction worldwide and in ancillary services auction in several markets. The participants do not have information on the other bidders and cannot respond to their offers. Every participant will submit the quantities of energy offered and an hourly time schedule with the corresponding asking prices for the following day. All the offers are then aggregated and ranked from lowest to highest, on hourly intervals. The market price and quantity are then established at the intersection of the resulting supply and demand functions for every hour.

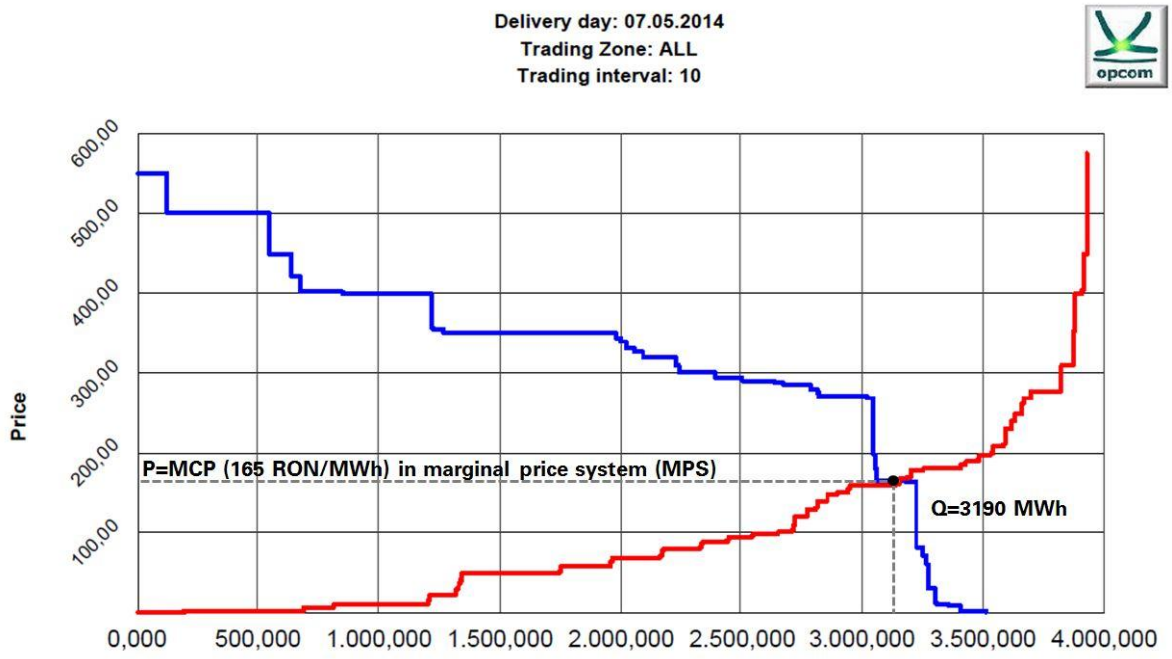

Figure 2. **Day-ahead market supply-demand curves for trading interval 10 from 07.05.2014**

Source: OPCOM Day-ahead market results for 07.05.2014.

As illustrated in Figure 2, all power generators supplying the system for a given hour receives the same market clearing price (MCP) and all demanders buying electricity during that hour will pay that price. Thus, the day-ahead auctions are uniform-price auctions. Energy producers participating in the bid that have prices reflecting the marginal cost of production and are lower than the MCP will receive an additional margin that will cover part of their fixed costs.

In this particular date and time, the MCP was 165 RON/MWh, for a demand of 3190 MW, from 9.00 am to 10.00 am, EET. Let's overlap the same time interval MCP, from the next similar day from demand perspective, which is 7 days away. The effect of

strong winds on MCP can be seen in figure 3, where vivid colors represents the curves from 07.05.2014 and desaturated ones the curves from 14.05.2014.

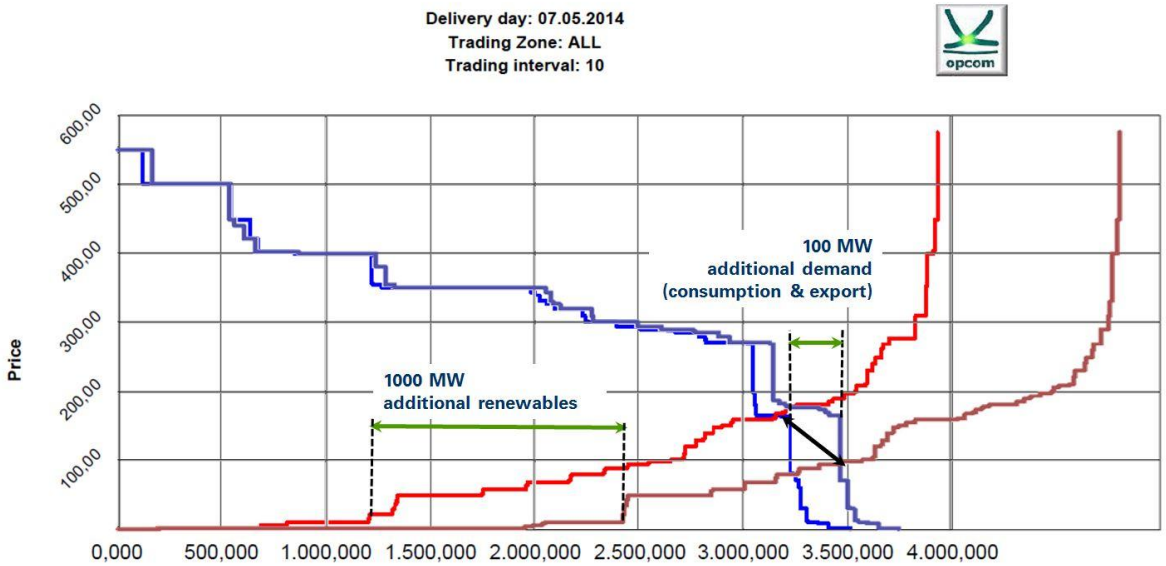

Figure 3. **Day-ahead market supply-demand curves for trading interval 10 from 07.05.2014 vs 14.05.2014**

Source: Authors' own research results/contribution
OPCOM Day-ahead market results for 07.05.2014/14.05.2014.

In this case, the effect of the additional 1,000 MW of wind was not off-settled by the additional 100 MW from demand leading to a shifting of the MCP from the previous 165 RON/MWh to as low as 100 RON/MWh.

This market model for power supply is based on the assumption of an infinite number of generators and buyers, with generators supplying a minimum amount of power each. Since the generators cannot affect the prices of the market, they are mostly going to bid their marginal costs of production for the offered electricity units. In case of Romanian' spot market, this assumption is almost valid on supply side, with more than 14,000 MW available capacity - according to Transelectrica, but not demand side, where no more than 4,000 MW hourly demand has be recorded since day-ahead market beginnings.

These marginal costs will include both the costs of actually producing each additional unit of output, but also the operating costs, as well as the opportunity costs arising from missed chance of selling energy on other related markets or at different time intervals. Here we have to mention the renewable promotion mechanism trough green certificates, a mechanism which working as a market driving 'subsidy' mechanism, which is lost if they renewables generators miss the chance to sell their energy production. Thus the generators will only produce energy if that will cost at the very least the marginal cost of production, as any price below that will result in financial loss for any unit of electricity produced.

If power generators bid above their marginal costs, they risk not winning the auction and having no profitable sales, while bidding below the marginal costs results in financial losses. Thus the only way to benefit from the market is to bid their true marginal costs, which means that the uniform price auction in the end leads to the highest level of efficiency and the least possible electricity prices.

Price formation on pay as bid auctions

On a uniform day-ahead market, the single market price is set by the plant with the highest marginal costs, and then paid to all lower cost generators. In the past, in many countries (USA, UK, and Germany) this situation was part of the public and political debate, as the market was suspected or even accused of being responsible for higher wholesale prices and that the consumers are overpaying.

Even if this debate is not so live nowadays, and even if marginal price system is creating a downward pressure on the Romanian electricity prices, the uniform price auction is best on short-run efficiency and is not able to provide incentive for the long-run efficiency, mainly because it focuses on marginal cost – variable ones – but discards all the fixed costs.

As a remedy, critics of the uniform-price auction regularly propose a discriminatory pay-as-bid auction. In a pay-as-bid auction, the total quantity traded is also determined by the intersection of aggregate supply and demand but in contrasts to the single-price mechanism, every bidder only receives its individual bid price.

Therefore, a pay-as-bid auction is characterized by price discrimination. The arguments in favor of a pay-as-bid mechanism can essentially are summarized as follows:

Hypothesis 1: *Payments to generators can be significantly reduced because plants that are ranked left of the marginal plant in the merit order - see figure 4 - must not necessarily receive the price of the most expensive generator (Ockenfels, A., Grimm, V., Zoettl, G., 2008, p. 21.).*

Hypothesis 2: *A pay-as-bid auction is more effective in disciplining market power because generators cannot influence the market price received by all their infra-marginal plants through strategically withholding capacity (Kahn, A. E., Cramton, P., Porter, R., Tabors, R., 2001, p. 7).*

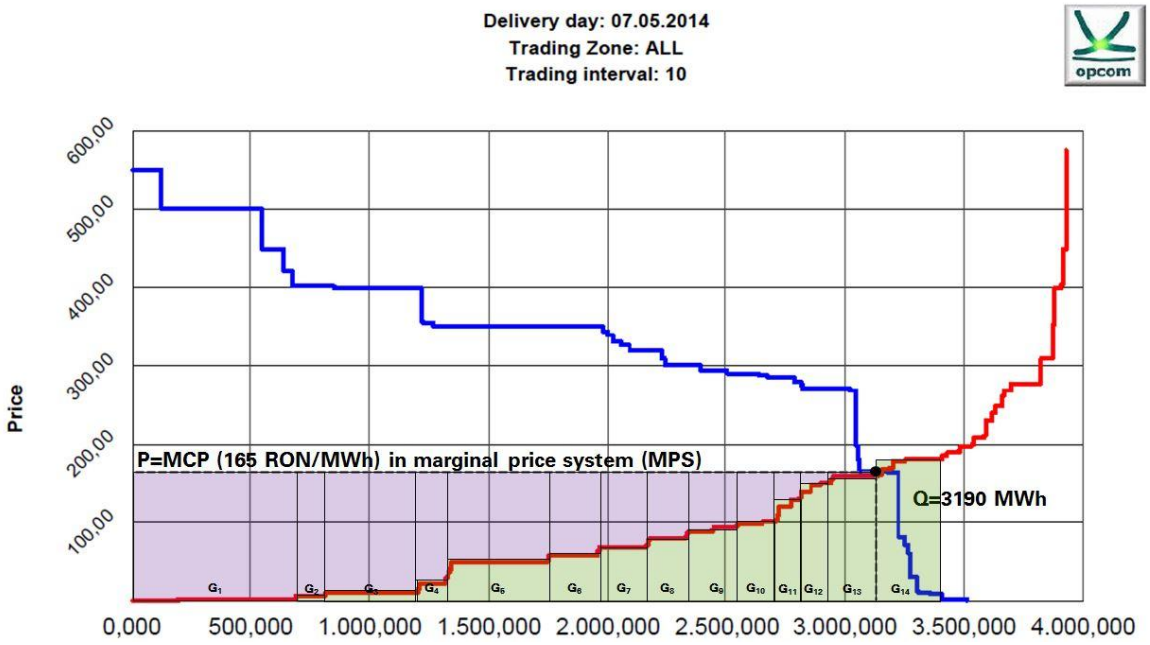

Figure 4. **Day-ahead market supply-demand curves from 07.05.2014 showing the infra-margin for all thirteen generators in the merit order**

Source: Authors' own contribution
OPCOM Day-ahead market results for 07.05.2014.

Research on advantages and disadvantages of switching from marginal pricing system to a pay-as-bid

The research methodology used to assess the advantages and disadvantages of switching the day-ahead marginal pricing system to a pay-as-bid one as a solution for spot energy market to allow different settling price for different generators is based on testing previously mentioned two pay-as-bid hypotheses under two different situations: the ideal one - perfectly know market information - where all participants can determine the market closing price, and the real one where the market information is known with a certain error.

The first situation, 'Complete market information' is derived from the theoretical origins of the Efficient Markets Hypothesis (EMH), and is connected with first studies of modern financial economics, widely analyzed by Mr. Fama (Fama, E. F. Efficient capital markets: A review of theory and empirical work. *Journal of Finance, 25(2): 383–417. 1970*). According to Mr. Fama's original definition, a capital market is said to be efficient with respect to a certain information set if security prices would be unaffected by revealing that information to all market participants. Hence, the description of the information set is the base for the definition of market efficiency.

The second situation, 'Incomplete market information' is based on the violation of the Efficient Markets Hypothesis (EMH). Market models defined on EMH is characterized by: rational agents realize higher returns that the irrational minority, and after a certain period of time the minority of irrational players is eliminated from the market. Increasing relevant information should be reflected in prices, making the market ever more efficient. The final results of this ideal model should be the end of trading activity since extra returns cannot even be expected and realized by market participants. But reality is totally different: Traders are human beings with their own perception of the surrounding reality, their own psychology and fears of failure. The economic consequences of those deviating behaviours cannot be explained under the framework of traditional theories and are usually labelled anomalies. Therefore each energy trader will predict the market closing price best on all available information data set and using own market prediction method. Because of this, each trader will have a different expectation on supply availability, total demand and closing price.

In marginal pricing system, all buy and sell offers are sorted therefore the supply-demand curves intersections determine the market closing price. The pay-as-bid mechanism, described by those two hypotheses, will be tested under previously defines 2 situations.

Hypothesis 1 is driven by the assumption that in a different auction design, like switching from uniform-price to pay-as-bid will not change the bidding behavior of generators. Following this assumption, competitive bidders still have an incentive to submit offers based on their marginal costs of production, despite the new market rules. This assumption cannot hold, as selling at their marginal costs, fixed costs cannot be recovered, not to consider a financial profit for the power plants. In a pay-as-bid regime, generators will adjust their bidding strategies. The pay-as-bid auction thus cannot be incentive compatible because it does not induce bidders to reveal their true costs of production but rather induces gaming. The resulting bidding strategy can be described as a game in which profit maximizing generators try to predict the MCP, i.e. the price of the marginal bid needed to clear the market, as accurately as possible based on their expectations.

Figure 5 illustrates the adjusted bidding behavior with generators having complete market information:

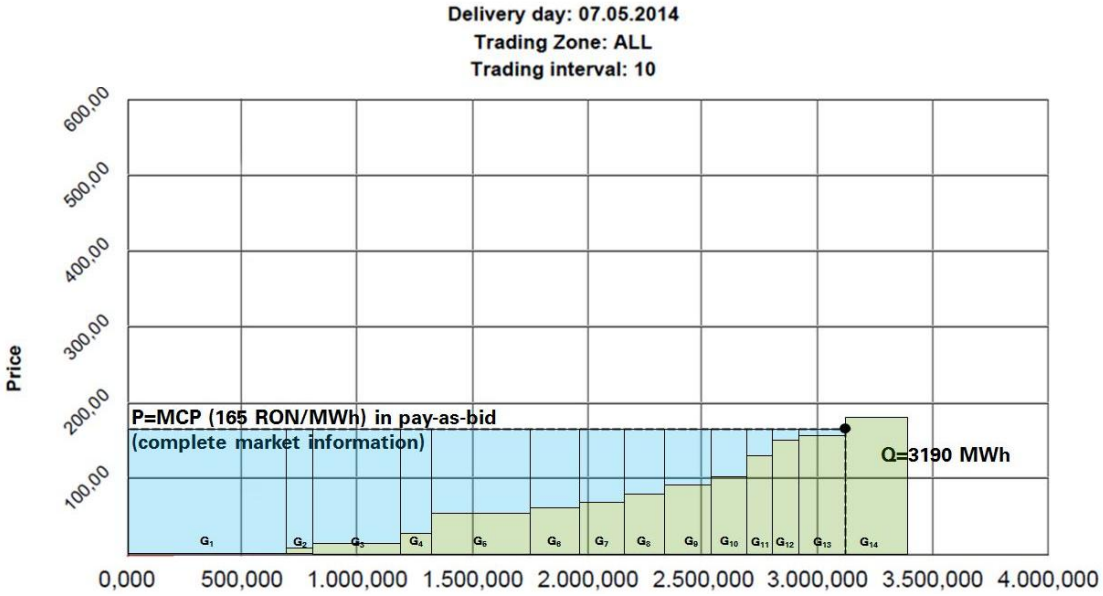

Figure 5. **Day-ahead market clearing price in pay-as-bid with complete market information**

Source: Authors' own contribution
OPCOM Day-ahead market results for 07.05.2014.

As each generator from the merit order can very accurately predict the merit order for the respective interval and the bidding behavior of each of the other market participants, they will bid with the expected market closing price and each of them will get the MCP. In this case, the pay-as-bid mechanism will have identical outcome as from the marginal price system.

In real life, generators cannot accurately predict the MCP because of the uncertainty around competitors' costs and demand elasticity. Bidders will have to forecast the MCP based on their expectations which results in uncertain market outcomes and productive inefficiency as shown in Figure 6.

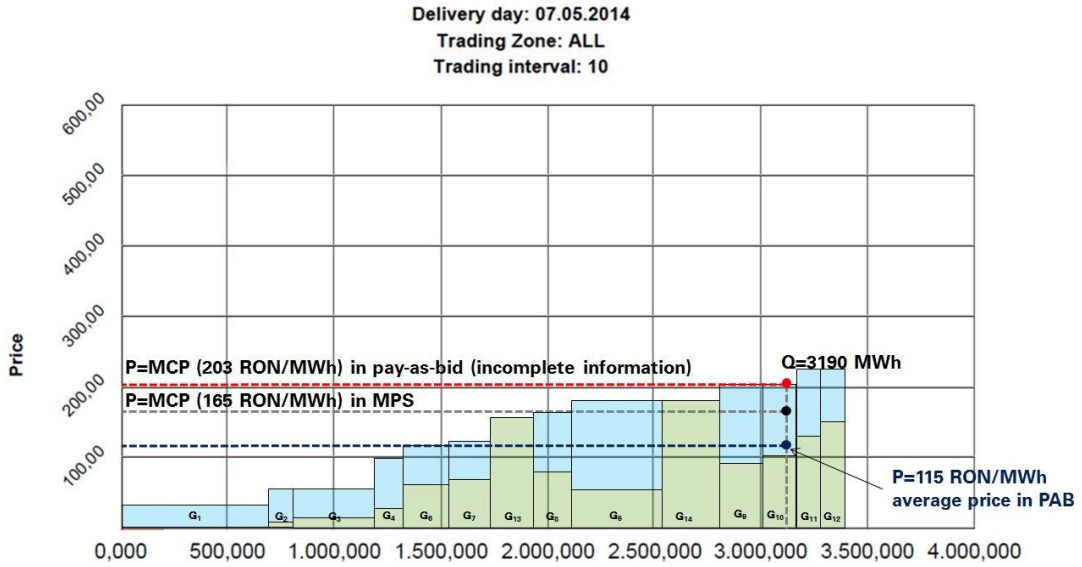

Figure 6. **Day-ahead market clearing price in pay-as-bid with incomplete market information – case A**

Source: Authors' own contribution
OPCOM Day-ahead market results for 07.05.2014.

Figure 6 shows how the uncertainties of generators' bidding behavior may result in an inefficient dispatch – G_{11} and G_{12} outside merit order - regardless of the fact that pay-as-bid is one of the most competitive auction mechanism. In case A, the least-cost dispatch principal of short term economic efficiency cannot be assured under pay-as-bid. Forecasting errors can also result in lower average prices if low-marginal-cost generators impose relatively low mark-ups, leading to average price in PAB of 115 RON/MWh versus a MCP of 165 in MPS. In the long term this behavior will lead to market signals of ineffective investments, because base-load plants will fail to recover their fixed costs. Reducing the base-load plants share from generation mix in favor of peak power plants like solar, and mid-load technologies – wind capacity factor is usually around 25% and hydro, 35% to 40% – would increase average electricity prices in the end. Not to mention the fact that increased strategic complexity of the pay-as-bid auction will cause inefficiencies due to bidders' large uncertainties incorporation into their bid calculations, raising transaction costs.

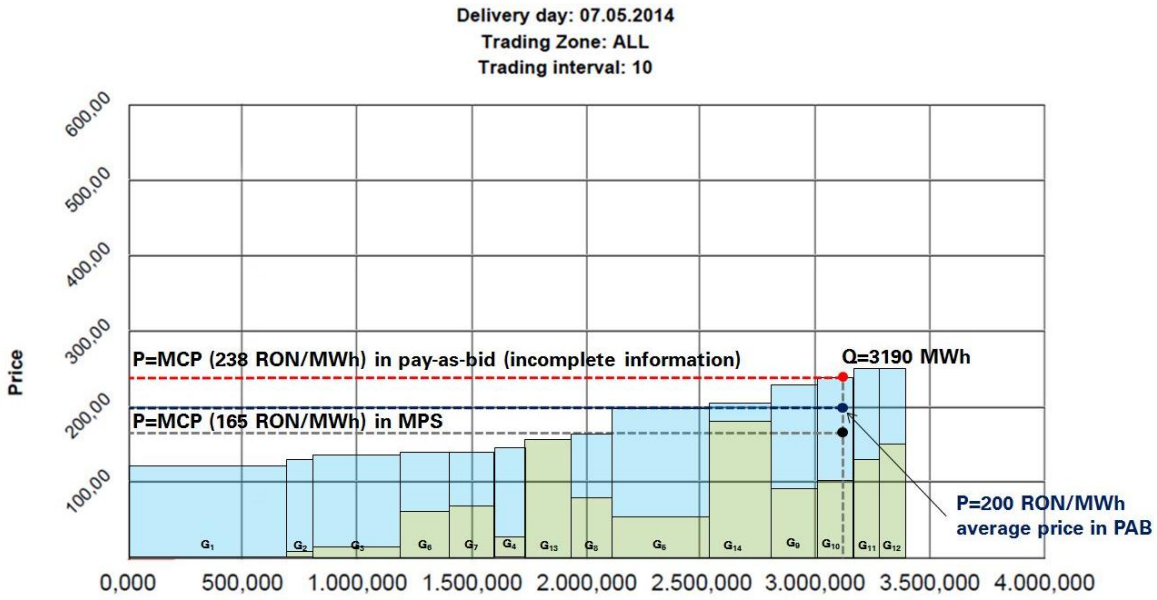

Figure 7. **Day-ahead market clearing price in pay-as-bid with incomplete market information – case B**

Source: Authors' own contribution
OPCOM Day-ahead market results for 07.05.2014.

In case B, pay-as-bid will lead to higher overall bids because generators have strong incentives to bid above marginal costs. In case B, the averge PAB is 200 RON/MWh, compared to 165 RON/MWh MCP in MPS. The MCP under pay-as-bid, therefore, cannot be lower than the MCP under uniform pricing. The bids in the pay-as-bid auction will differ in small amounts, as each generator will attempt to bid close to the MCP.

Conclusion

In wholesale electricity markets, the impact on the short-run prices of pay-as-bid auctions is negligible, but these auctions do reduce the efficiency of plant dispatch, thus affecting the market efficiency. The power system economic objective being the production of power at the lowest total cost, it has to rely on the economic dispatch of

resources in order to accomplish that result, based on short-run marginal cost. The accomplishment of these goals is sustained by the clearing-price auction, as the suppliers have the financial incentives to bid their short-run marginal cost.

In the case of pay-as-bid auctions, the suppliers are not encouraged to stick to marginal costs, as they need to guess the market clearing price. Their bids are thus depending on their various random forecasts of market prices, not on their different costs in electricity production, meaning that the lowest bids are not necessarily tied to the lowest marginal costs. Apart from that, since the energy cannot be stored, unexpected variations of supply or demand can create dramatic shifts of prices daily or even hourly, leading to less efficiency compared to uniform pricing.

The pay as bid auctions, instead of reducing the prices, is thus likely to achieve the opposite, caused by both the bidding behavior of producers and the dispatching inefficiencies.

The uniform price mechanism under Romanian generation mix with more than 5,000 MW installed capacity in renewables is creating benefits on demand side but is putting pressure on long-run economic efficiency of base load plants, therefore day-ahead mechanism of a uniform price needs to be correlated with all other electricity market mechanism, for power and ancillary services, in order to secure long term efficiency on both demand and supply side.

Pay as bid in day ahead will not solve the problem of Romanian day-ahead market: all renewables generators can sell their less predictable production only on spot market, bidding at low prices - due to low marginal costs, in a less than 3,500MW market depth. This is leading to extremely low clearing prices on off-peak hours and during windy hours, affecting conventional production capacities dispatch.

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Energy security: between markets and sovereign politics

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Abstract. *Energy security is a constant presence in the energy-related political discourse all over the world. States strive to secure steady inflows of needed energy supplies, as well as the price affordability of those supplies. However, what are deemed to be the best means to meet such goals depends on one's theoretical vantage point. On the one hand, economically-minded theorists maintain that energy security is only a matter of market rules and interactions. Thus, they call upon energy markets to deliver both steady supplies and competitive prices. On the other hand, politically-minded scholars emphasize the political and hard-power nature of international energy trades, especially in a global context market by the emergence of state-centered, authoritarian regimes that use large national energy companies as foreign policy instruments. These two positions delineate competing approaches to how energy security risks ought to be managed. The former approaches energy security risks by means similar to portfolio management, requiring diversification of investments in order to insulate them from market shocks. The latter approaches energy security as a matter of foreign policy, by which states envisage interest coordination and favorable alignments within countervailing alliances against the agent of energy security risk. The present paper goes beyond the uncontentious point that these two dimensions are complementary. It argues that, depending on the international context, a more market-driven or a more-politically driven behavior may be adequate*

Keywords: energy security, foreign policy, security of supply, energy market.

Introduction

Energy security is a common strategic objective in the energy policy of states. For net importing countries, it refers in the first place to the security of energy supply, which in turn has to do with a state's ability to secure the needed energy imports from various sources and through various conduits at an affordable price. For net energy exporting countries, energy security designates rather the state's ability to secure and maintain market share.

Either way, there is an intrinsic political element to energy security, as international energy trade puts producer, transit, and consumer countries in relations of mutual (though not necessarily symmetrical) dependence, which are prone to being politically instrumentalized. Besides, as Shaffer (2009, p. 3) notices with respect to the international oil trade,

„Energy use affects the structure of the international system itself: oil use creates an element of interdependency in the international system. Since oil is a global commodity, each country's demand affects the price and supply availability of oil for all consumers."

Seen from the vantage point of the main actors at the international level (states, organizations and corporations), one paradigmatic approach to energy security is the market-driven one, which relies on inclusive, competitive and transparent international markets for ready access to energy. In a market-based environment, both pricing and flows of energy are optimized through the unhindered equilibrium of supply and demand. Accordingly, energy becomes a foremost commodity, delivered by profit seeking suppliers, and energy security risks are managed similarly to portfolio management on the capital markets (Van der Linde 2008), with portfolio diversification and hedging contracts as instruments of risk mitigation.

As a matter of fact, the radicals in this camp, such a Noel (2008), dismiss the concept of energy security altogether, arguing that energy trade is shaped by market forces alone, with no substantive role to play for politics and geopolitics. There is a naïve ring to this claim, unless one reads it as implying that, in spite of the appearances, state action in the energy realm, domestically and internationally, is ultimately shaped by market fundamentals.

The reality of international energy trade is not properly mirrored in either of these two extreme accounts, but rather has embraced hybrid forms of international energy systems imperfectly market-driven and incompletely state-controlled. For clarity, we focus on the international oil trade, although the arguments apply, with due qualifications and differentiations, to natural gas, coal, uranium or renewable energy technologies.

The paper also addresses the energy policies of the EU, which for more than two decades have been consistently liberal, rule-based, and nondiscriminatory, even as the international energy scene has seen a clear shift toward a realist approach, as aptly argued by Goldthau and Sitter (2015).

Historical elements of the international oil trade

After World War II until the mid-1970s, the international oil trade was dominated by an informal cartel of Anglo-Saxon companies that controlled about 85% of global oil reserves, as well as production, transport, refining and retail, to the result of effectively setting the oil price internationally. The cartel was pejoratively dubbed „Seven Sisters"

by Mattei in the 1950s, back then head of Eni, the Italian state oil company, in frustration for his company's failure to be accepted in the Consortium for Iran, i.e. the group of seven international companies that had controlled the Middle Eastern oil production after the war, and were preparing to bring Iranian production back on the international market following the coup d'état of 1953, against Prime Minister Mohammed Mossadegh (Yergin 2009).

With the significant exception of the Socialist bloc, world production was utterly privatized until the early 1960s. Another major exception was Pemex (*Petroleos Mexicanos*), built after the nationalization of oil producers in Mexico in 1938. As observed by Aguilera and Radetzky (2015, p. 42),

„In the 1960s and 1970s, there followed a wave of nationalizations comprising Algeria, Iraq, Kuwait, Libya, Saudi Arabia and Venezuela among others..., so that by 1979, no less than 55 percent of non-Socialist world oil production had become government owned."

All in all, from the early 1970s to the mid-2010s, the oil price saw an unparalleled tenfold increase, reaching an absolute record of $147 a barrel in June 2008. After a 60 percent fall in the aftermath of the financial crisis of 2008, the price gradually climbed back to over $100, where a balance was maintained until mid-2014. Then, from June 2014 to the early 2015, a renewed 60% fall took place, in a protracted slump that has reached its lowest point so far in February 2016, at $28 a barrel of Brent.

Current specifics of oil trade

The structural causes of the currently oversupplied market have to do, in the first place, with the shale revolution in North America, which turned the U.S. into the world's largest oil producer of the past few years, concomitantly with diminished demand from China. And again, Saudi Arabia has played a major catalytic role, with its decision to maintain high output in an oversupplied market, effectively declaring a commercial war for market share to all non-OPEC producers. In the process, though, many other producers within and outside OPEC have taken serious economic damages from the protracted low oil prices, with Russia, Venezuela, and Iran among them.

In a buyer's market such as today's one, energy security risk management has generally shifted from a mainly geopolitical to a more market-driven mode, though pockets of heightened geopolitical tensions have remained active in areas such as the Black Sea and the Baltic Basins – not to mention the Syrian theater of war.

Another characteristic of the present oil trade that has developed along with the waves of nationalizations in the oil and gas industry is the dominant presence of national oil companies (NOCs). Grounded on nationalized assets from the Western international oil companies (IOCs), and owning most of the planet's oil reserves and production volumes, the largest NOCs have, by and large, dwarfed IOCs in the global ranking of the largest oil companies.

In a parallel development, the governments of hydrocarbons producing countries have almost invariably tended, in contexts of high prices, to revise the fiscal frameworks applied to the industry with the aim of capturing higher rents. Thus, a breed of short-term thinking oriented towards balancing state budgets and financing public spending has systematically curtailed the industry's ability to invest in new production capacities, to the effect of diminishing output. Therefore, unintentionally, governmental greed and shortsightedness has actually „functioned like an international cartel, constraining long-run supply." (Aguilera and Radetzky, 2015, p. 53).

Finally, a more recent factor shaping energy policy, in general, and the future of fossil fuels, in particular, is the corpus of energy policies and regulations related to the reduction of greenhouse gas (GHC) emissions, with the aim of limiting the ongoing global warming phenomenon to a ceiling of average temperature increase of 2C compared to the preindustrial level. Now, climate policies are typically perceived as dealing with market failures, i.e. with key social services in which the market has no incentives to invest. Accordingly, climate policy has emerged as a new area of state-led policy making, justifying sometimes swiping state interventions into the energy markets. Indeed, with a broad array of support schemes and bonuses, penalties and exemptions, state help of some form has become a condition for competitive advantage on the energy market for virtually every new power generation capacity.

Oil will likely remain the indispensable fuel in the transport sector for decades to come, although, here again, state-supported businesses and activities, such as electro-mobility, are starting to make a dent in gasoline's and diesel's largely unchallenged dominance.

The EU as a liberal actor on the international energy markets

In an excellent recent book, Goldthau and Sitter (2015) analyze the paradoxical development of the EU as a liberal actor in energy matters in an international context increasingly dominated by the realist paradigm. After the Maastricht Treaty of 1992, the newly minted European Union undertook to extend the Single European Market (SEM) to the electricity and natural gas markets. EU-wide energy markets unification was to be achieved through precise, rule-based integration, on open and competitive basis – an approach that went deeply against the grain of the monopolistic arrangement in place in most EU member states.

Through three successive Energy Market Packages, consisting of regulations and directives, Brussels has managed to largely deregulate EU's energy markets, to foster competition and transparency of tariffs and costs, to promote interconnectivity of grids, bidirectional gas flows, as well as put in place more competitive market models for both electricity and natural gas. Indeed, the liberalization of the EU internal market has proved, for all its insufficiencies, to be the most successful segment of Brussels's energy policies. It has progressed in parallel with state-centered energy foreign policy making, by which member states kept pursuing advantageous bilateral deals with external natural gas suppliers, even as the behavior of such suppliers was exacting costs from Eastern European member states.

By design, the EU lacks both the means and the unity of strategic vision to counteract in kind the geopolitical undertakings of realist actors. In its foreign energy relations, the EU's liberal „genes" can be vindicated by its sheer market size and robustness of its rules. The EU cannot project hard power, as it has no significant one. The EU energy diplomacy basically consists in economic and climate diplomacy, oriented toward exports of clear energy technology, along with the creation of a global energy governance model that promotes a bold regime of GHG reduction. As observed by Youngs (2007), the EU has in its foreign energy policy the tendency of extending upon its neighbors its acquis communautaire, in order to develop a common regulatory area with shared rules for energy trade, transit, and environmental protection.

For its uninterrupted supply with primary energy commodities, the EU has to rely on the hard power capabilities of other liberal actors – particularly on the foremost role of the United States – to make sure that oil, gas, coal, uranium etc. can find their way to the international markets, despite the numerous security threats facing the world today.

Conclusion

The market-based, liberal, and the state-centered, realist paradigms are the two ends of a spectrum of approaches to managing energy security risks. In reality, neither of these two paradigms is ever realized in pure form, although they have been closely approximated in particular historical junctures – the 1990s for the liberal paradigm, the 2000s for the realist one. Otherwise, hybrid forms of behavior have resulted out of the mixed state and corporate interests in maximizing energy security, economic gains, as well as in achieving other political goals.

Both energy producing and energy consuming states have found convenient to have a functional market regime, able to offer quick access, diversification and convenient prices. However, formal and informal cartels or monopolies have attempted to extract higher gains, albeit just for short timespans. NOCs have, at times, tried to emulate IOCs conduct on the capital markets and in terms of company management. However, they have served domestically as sources of cash for the governments' budgetary needs, and externally as foreign policy tools of their geopolitically minded patrons. At the same time, the realist power games prompted by high prices in the energy exporting countries have time and again been brought back to earth by price shocks, followed by painful adjustments of public spending. Moreover, governmental greed and shortsightedness, often elicited by public demands, lead to imposition of harsh fiscal terms on the upstream sector in times of high prices, to the effect of insufficient investments in capacity replacement and technology.

Finally, the EU is an atypical energy actor, of invariably liberal constitution in a world of increasingly realist complexion. Largely dependent on energy imports, the EU's approach to energy security has been to build up a rule-based, competitive and transparent internal market, in which external suppliers must act according to the rules. A rule-based environment will deprive them of the means to discriminate between markets and to exert inordinate political pressure.

On the other hand, EU's foreign energy policy is hardly able to deal with potential challenges from geopolitically assertive third parties and unstable external suppliers, as it lacks the needed unity of strategic vision and hard power.

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Effective energy planning for improving the organization's energy performance

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Abstract. *The global pressing need to protect the environment, save energy and reduce greenhouse gas emissions worldwide has prompted the organizations to implementing both individual energy saving measures and a more systematic approach to improve the overall enterprise's energy performance. As such, organizations are encouraged to manage their energy related matters in a systematic manner and a more standardized way, to ensure continual improvement on their energy efficiency. The release of the international standard ISO 50001 was meant to help the organizations develop sound energy management systems and effective process-based energy management structures that could be recognized through third-party certification. ISO 50001 is a globally accepted framework for managing energy, providing general energy management system requirements and guidelines for organizations to increase energy efficiency, reduce costs, and improve environmental performance. The current paper outlines the essential steps the organizations should take to practically design a sustainable energy management system. By using multiple real case examples, it presents the approach that the companies should use to effectively develop their energy planning and improve energy performance. The key components of the company's energy planning are introduced, as well as practical examples of energy objectives and performance indicators from various industries are offered.*

Keywords: ISO 50001, energy management system, energy planning, energy objectives, energy performance indicators, energy action plan.

Introduction

Organizations worldwide are currently facing big challenges in terms of managing energy performance, ranging from increasing need of renewable energy use, reducing energy costs, reducing carbon emissions and protecting the environment, up to ensuring transparency and reduction of energy consumption, increasing productivity and improving compliance with energy legislation. These global pressing needs have prompted the organizations to implementing both individual energy saving measures and a more systematic approach to improve the overall enterprise's energy performance and increase its competitiveness (OGP/IPIECA, 2013; Schneider Electric, 2012; ISO, 2011).

The international standard ISO 50001 Energy Management System was developed to assist the companies in their efforts to manage their energy related matters in a systematic manner and a more harmonized way (ISO, 2015; The Hong Kong Electronic Industries Association – HKEIA, 2013). By designing and implementing sound energy management systems and effective process-based energy management structures, organizations will demonstrate care about continual improvement of their energy performance (Brown and Desai, 2014; Gopalakrishnan *et al.*, 2014). Although, the achievement of ISO 50001 certification will impact incrementally organization's financial performance on longer term (Majerník *et al.*, 2015; Pham, 2015).

Already existing management structures and a strong culture of systematic process management developed through implementation of ISO 9001 model of quality management system and ISO 14001 model of environment management system make it easier for organizations to integrate energy management (Karcher and Jochem, 2015). Also, harmonized standards for implementation across the organization together with a logical and consistent methodology for identifying and implementing improvements will guarantee company's sustainability and increase its competitiveness.

The current paper outlines the essential steps the organizations should take to practically design and implement a sustainable energy management system. By using real case examples, it describes the approach that the companies should use to effectively develop their energy planning and improve energy performance. Key figures about ISO 50001 certification, worldwide, are presented and the key components of the company's energy planning are explained, by offering practical examples from various industries.

Energy management system

Key figures on ISO 50001 worldwide and in Romania

An energy management system (EnMS) is a performance management system that enables employees, managers and organizations to plan, make decisions, and take effective action to better manage energy use, consumption and costs (ISO, 2015; TÜV UK Ltd, 2013; ISO 2011). It helps an organization to set energy objectives and targets and to monitor, measure, and analyze energy performance.

Overall, an EnMS establishes the general framework and specific requirements and conditions for organizations to manage effectively energy (TÜV UK Ltd, 2013). It supports organizations in making better use of their existing energy consuming assets as well as reinforces good energy management behaviours. It facilitates communication on the management of energy resources and identifies the needs for implementation of

new energy-efficient technologies. An energy management system also alerts the organizations to significant deviations from energy baselines and targets.

The organizations' interest in achieving ISO 50001 certification for their energy management system has increased tremendously worldwide since the release of the standard in 2011, with the most dominant trend line in Europe (Table 1 and Figure 1).

Table 1. *ISO 50001 certificates worldwide*

Year	2011	2012	2013	2014
TOTAL	**459**	**2236**	**4826**	**6778**
Africa	0	13	36	18
Central / South America	11	10	34	63
North America	1	9	34	85
Europe	364	1,919	3,993	5,526
East Asia and Pacific	49	191	478	698
Central and South Asia	26	76	189	299
Middle East	8	18	62	89

Source: ISO Survey 2014, www.iso.org.

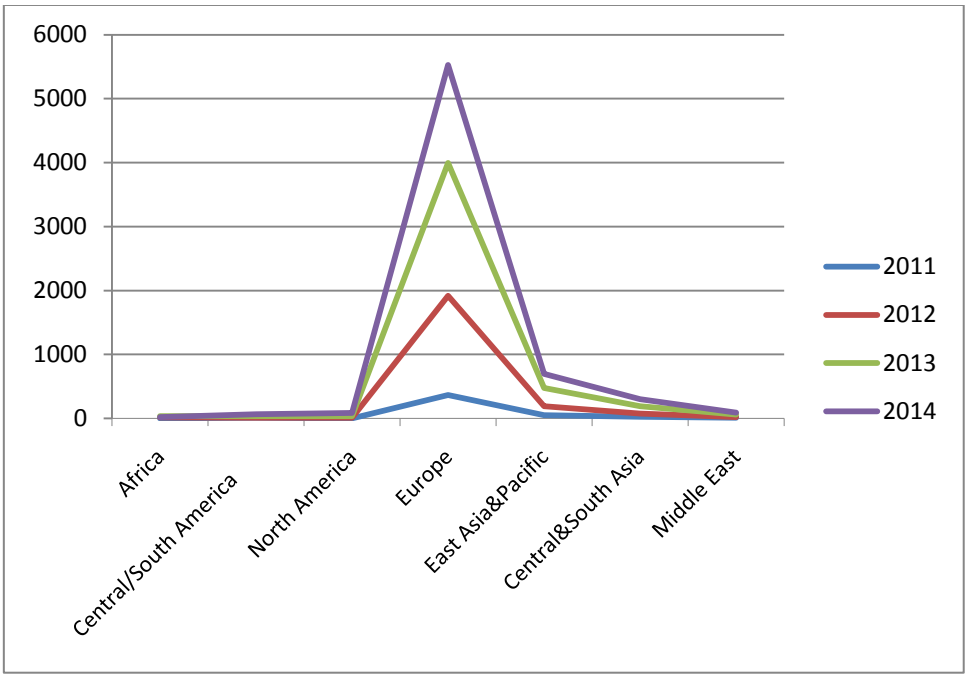

Figure 1. **ISO 50001 certificates trend lines worldwide**
Source: Authors, processed based on ISO Survey 2014.

Figure 2 shows the distribution of ISO 50001 certificates achieved by organizations in different European countries with the trend line for Romania. As it is presented in Table 2, the top ten countries ranked worldwide in 2014 for ISO 50001 certificates is predominantly consisted of countries coming from Europe, with Germany ranking first and a dominant position.

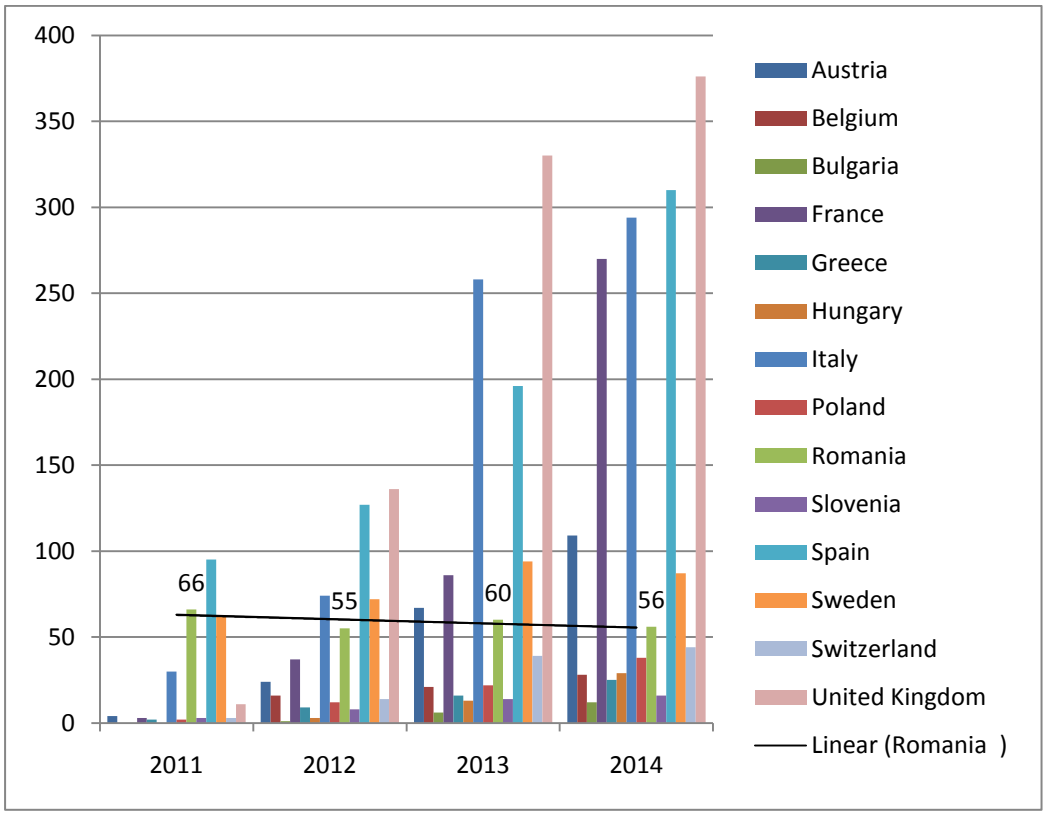

Figure 2. **ISO 50001 certificates in Europe (without Germany)**
Source: Authors, processed based on ISO Survey 2014.

Practice shows that implementation of an energy management system gives customers, employees, top management and all stakeholders more confidence that the organization cares about energy, is committed to improve its energy performance and, actually, saves energy (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety – BMU, 2012). Also, already existing management structures developed through implementation of different ISO models of performance management support the organizations to integrate energy management.

According to ISO Survey 2014, Romanian organizations manifest a relatively large interest in implementing the ISO models of performance management (either we refer to quality management system, environment management system, food safety management system or information security management system), with a continuous increasing trend line for each ISO model of performance management (see Table 3 and Figure 3).

Table 2. *Top 10 countries worldwide for ISO 50001 certificates – 2014*

Top 10 countries for ISO 50001 certificates		
1	Germany	3402
2	United Kingdom	376
3	Spain	310
4	Italy	294
5	India	271
5	France	270
7	Taipei, Chinese	176
8	Thailand	168
9	Austria	109
10	Korea, Republic of	102

Source: ISO Survey 2014, www.iso.org.

Table 3. *ISO certificates in Romania*

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
ISO 9001	6097	9426	9633	10737	15865	16200	14345	18014	18450	18987
ISO 14001	752	1454	2269	3884	6863	7418	7394	8524	8744	9302
ISO 13485	4	2	9	8	28	56	109	97	96	64
ISO/TS 16949	6	115	155	181	194	209	217	229	253	282
ISO 22000	-	-	276	347	661	641	698	996	1014	1130
ISO/IEC 27001	-	4	16	44	303	350	575	866	840	893
ISO 50001	-	-	-	-	-	-	66	55	60	56

Source: ISO Survey 2014, www.iso.org.

Legend:

ISO 9001 – Quality management systems – Requirements
ISO 14001 – Environmental management systems – Requirements with guidance for use
ISO 13485 – Medical devices. Quality management systems – Requirements for regulatory purposes
ISO/TS 16949 – Quality management systems – Particular requirements for the application of ISO 9001 for automotive production and relevant service part organizations
ISO 22000 – Food safety management systems – Requirements for any organization in the food chain
ISO/IEC 27001 – Information technology. Security techniques – Information security management systems – Requirements
ISO 50001 – Energy Management – Requirements with guidance for use

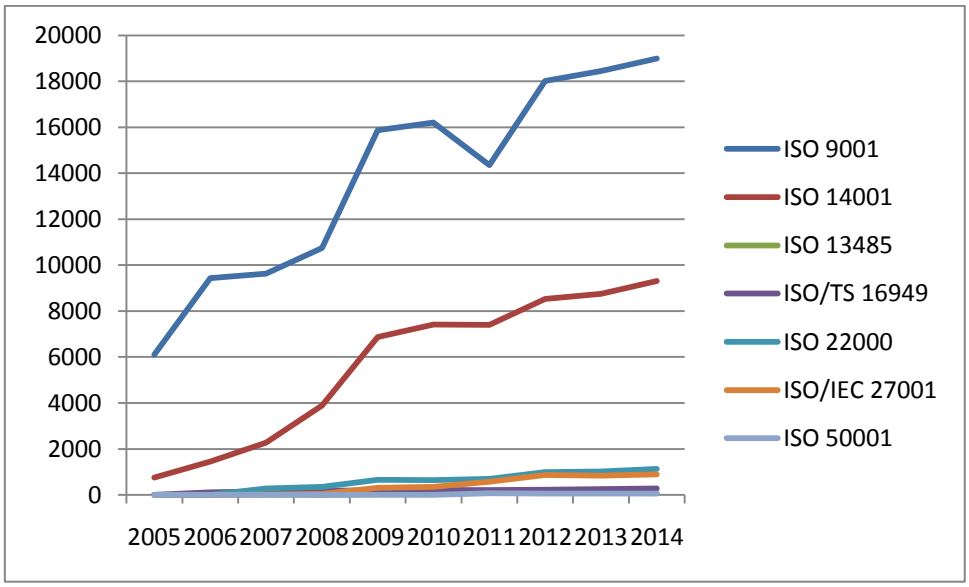

Figure 3. **ISO certificates trend lines in Romania**
Source: Authors, processed based on ISO Survey 2014.

Also, in comparison with other European countries, Romanian organizations acknowledge great benefits as results of achieving ISO 50001 certification, manifested through the large interest shown for adopting the standard, since its development in 2011 (Figure 4). At OMV Petrom, for example, the main benefits of achieving certification of their EnMS include: enhanced security of energy supply, commenced processes to reduce energy risk exposure in different areas, continual improvement of operational efficiencies and maintenance practices, reduced greenhouse-gas emissions and carbon footprint, additional cost savings over the years.

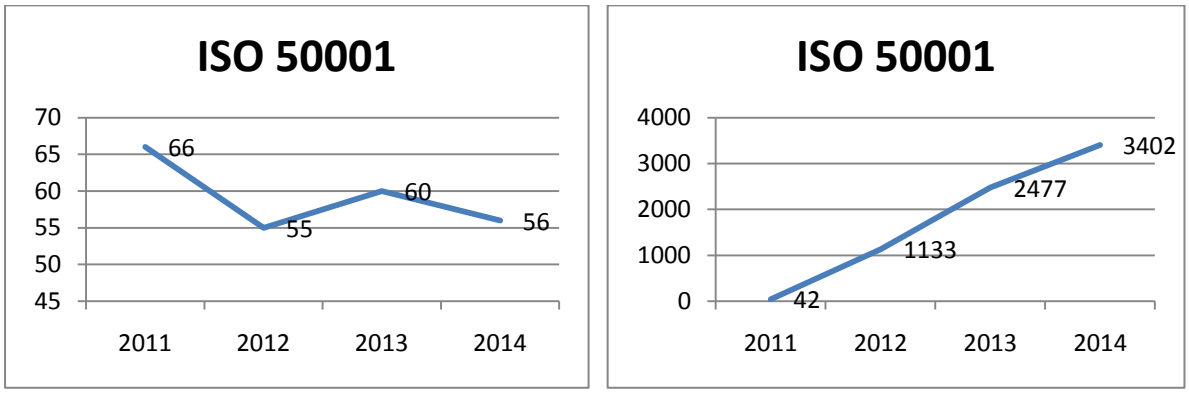

Figure 4. **ISO 50001 certificates in Romania vs. Germany**
Source: Authors, processed based on ISO Survey 2014.

Although, Germany dominates clearly the worldwide ranking in what concerns the number of ISO 50001 certificates achieved by organizations.

Energy planning

In the acceptance of the international standard ISO 50001, energy management refers to the systematic coordination of the procurement, conversion, distribution and utilization of energy in order to achieve energy objectives and performance indicators.

An ISO 50001 energy management system, like all the ISO management systems, works on the Plan-Do-Check-Act cycle, meaning (ISO 50001:2011; ISO 50004:2014): a) understand energy management basics, communicate benefits and get commitment of senior leadership, b) define an energy policy and create the energy team, c) conduct an energy review, which involves analyzing energy data, identifying areas of significant energy use and areas for energy performance improvement, d) establish an energy baseline, e) establish energy objectives and targets that are measureable and have timelines for achievement, f) establish an action plan to achieve energy objectives and targets, g) allocate resources and implement the action plan, h) check performance and take corrective, preventive and improvement actions, i) monitor, document and report results (Figure 5).

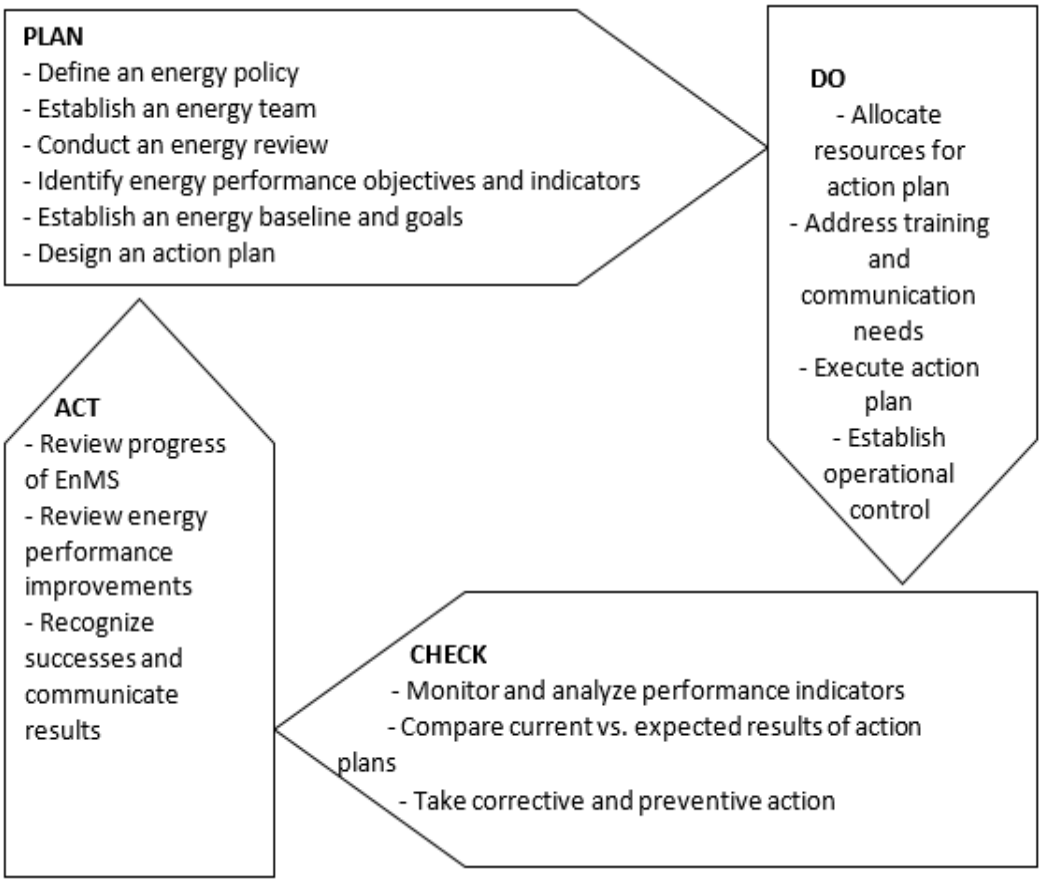

Figure 5. **PDCA cycle for energy management**
Source: Authors' own research adapted, based on ISO 50001.

Energy planning, as integrative part of an energy management system, addresses specifically the following requirements (ISO 50001): a) legal and other requirements applicable to the organization's energy uses, b) energy review, c) energy baseline, d) energy performance indicators (EnPIs), e) energy objectives and targets, and f) energy management action plans.

Energy management planning also forces the organization to identify and analyze which factors and variables affect its energy use at the level of entire organization, each business unit, a facility, or even an individual process or functional group, and to take action accordingly.

Energy planning can be done at different levels of an organization, depending on the size and structure of the business. It can be developed for an entire organization, a business unit, a facility, or even an individual process or functional group.

Energy performance

The increasing prices of oil and other natural resources, as well as the increasing public awareness on environmental issues have pushed organizations to reconsider their energy policy and people to pay more attention to the energy performance of their businesses (OGP/IPIECA, 2013). The main purpose of adopting an energy management system is to enable an organization to improve its energy performance, which includes: energy efficiency, energy consumption, and energy use.

Energy efficiency is about energy security and care for the future. It has the goal to reduce the amount of energy required to provide products and services, to use of less energy to provide the same energy service.

In the acceptance of ISO 50001, energy consumption refers to the number of kilowatt-hours measured periodically from every energy source. It is computed by using the following formula: the energy E in kilowatt-hours (kWh) per day is equal to the power P in watts (W) times number of usage hours per day t divided by 1000 watts per kilowatt (from every energy source):

$$E(\text{kWh/day}) = P(\text{W}) \times t(\text{h/day}) \,/\, 1000(\text{W/kW})$$

Energy use is measured in relation with each energy source: fossil fuels (coal, oil, and gas), nuclear power, renewable energy (hydroelectricity, wind power, solar energy, geothermal, biomass and biofuels, marine and hydrokinetic (MHK) energy.

Designing an effective energy planning

By taking into account the energy management framework introduced above, an effective energy planning process requires consideration of the following steps:

- Investigation and testing of existing energy management system implementation;
- Defining the energy policy;
- Analysis of energy usage;
- Estimation of expected energy usage;
- Identification of areas for potential improvement on energy performance;
- Identification of all persons and their activities, which affect total energy usage;
- Accounting for compliance with legal requirements on energy;
- Determination of responsibilities for energy management;
- Development of energy baseline;
- Development of measurable, documented and (within a time frame) achievable energy goals and targets;
- Development of energy action plans.

Thus, the organization must demonstrate that it complies with applicable legislation and other requirements related to energy use, consumption and efficiency to which it subscribes.

The organization must record and maintain an energy review with certain documented methodology and criteria. An energy review is a process to determine an organization's energy performance based on existing data, actual measurement and/or predictions, leading to identification of opportunities for improvement on energy

performance. As result of the energy review, an organization will create its energy profile (Figure 6). The energy profile provides useful information for the development of the energy baseline and the identification and selection of energy performance indicators. Examples of EnPIs might include: energy consumption per time, energy consumption per unit of floor area, energy consumption per unit of material consumed or transported, etc.

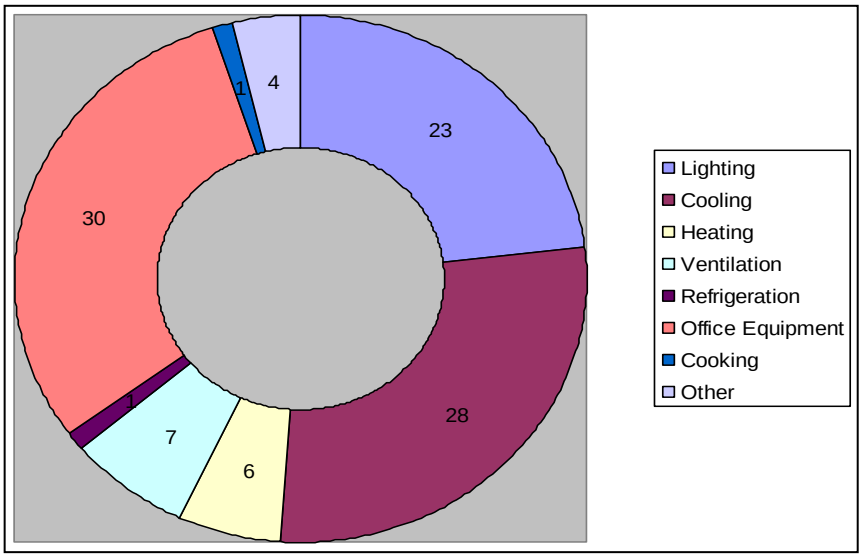

Figure 6. **Energy profile for an organization**
Source: Authors' own processing.

Documented energy objectives and targets should be established to ensure compliance with the organization's energy policy, to help organizations use more efficiently energy, and to facilitate continual improvement in energy performance. Objectives should state what the organization wants to achieve; while targets should specify how the organization would achieve those objectives.

The objectives and targets should be practical, achievable and measurable, and must conform to the organization's business objectives. Real case examples of energy objectives and performance indicators are given in Table 4. Energy policies and objectives should be aligned with existing business priorities and objectives. Also, these should be a key component of an organization's continuous improvement efforts.

Table 4. *Energy objectives and performance indicators*

Company: ABC *Industry* : Natural stone production *The domain of applicability of ISO 50001*: Cutting, shaping and finishing of natural stone using highest technologies and equipment	
Energy objectives	**Energy performance indicators**
• To reduce energy consumption in buildings by 60% over a 5-year period; • To reduce energy intensity (kBtu/sf) by 25% in existing building over a 5-year period; • To achieve and maintain LEED Silver certification or higher for 50% of all portfolio at all times; • Design and construct all new developments to achieve 60% energy savings over local building energy codes;	• Total energy consumption of production area. • Electricity use per unit of production area. • Energy intensity indicator: EI indicator=Real Energy Consumption year 20xx/Reference Energy Consumption year 20xx.

• To earn the Energy Star label for 50% of all portfolio, beginning in 20xx and reapplying for and maintaining the labels each year thereafter.	
Company: XYZ *Industry* : Retail clothing *The domain of applicability of ISO 50001*: Textiles – renewable energy, machines, recycling waste, development of alternate fibers sources for man-made cellulosic fabrics	
Energy objectives	**Energy performance indicators**
• To reduce operation's total greenhouse gas emissions by end of 20xx while growing 9%-13% annually; • Reduction in energy consumption per SQM with 25% by 20xx in stores, offices and warehouses, by using LEED lights; • Reduction in energy consumption during manufacturing processes – colder water for washing leads to a reduction of 60% in energy consumption.	• Energy usage in gigajoules – for monitoring if EnMS is implemented on spot (stores, offices etc,); • CO2 emission – monitor the activity; • Tones of water – monitor activity and EnMS implantation also looking for new ways of energy an d water savings; • Percent of renewable energy used – the goal 80% or 100% were it is possible; • Tones of garments and waste recycled – for continuing being climate friendly; • Percent of energy and water saving – improving EnMS; • Percentage in reduction CO2 in value chain.
Company: UVW *Industry* : Design and consultancy services for buildings *The domain of applicability of ISO 50001*: Design and consultancy services for buildings	
Energy objectives	**Energy performance indicators**
• Purchase of energy efficient products (Class A or higher) when replacements of equipment are necessary; • Designing solutions to lower energy consumption for lighting, heating, cooling at the company in the next year and their implementation in the coming years; • Introducing equipment that uses renewable energy systems at the company's facilities in more than 4 years; • Reducing energy consumption for lighting with 2.5% by changing the work schedule accordingly with the natural light availability; • Reducing energy consumption for lighting with 2.5% by installing presence sensors in restrooms and kitchen; • Reducing energy consumption for lighting with 6% by using LED light sources for permanent occupied desks.	• Specific energy consumption for lighting (electric kWh/sqm*year); • Specific energy consumption for heating (electric kWh/sqm*year); • Specific energy consumption for cooling (electric kWh/sqm*year).
Company: OPR *Industry* : Electricity and natural gas supply in Romania *The domain of applicability of ISO 50001*: Electricity production and electricity supply to the entire firm portfolio of final consumers	
Energy objectives	**Energy performance indicators**
• Reduce invertors DC electricity consumption by 15% until end of 20xx; • Reduce energy consumption for lighting by 10% until end of 20xx; • Increase electricity production by 20%.	• Total electricity production per square meter of installed PV panel; • Total electricity use of invertors; • Total electricity use for nocturnal illumination and supervisory activities.

Company: LMN *Industry* : Food retail (the largest coffeehouse company in the world, US multinational company) *The domain of applicability of ISO 50001*: The entire retail area (offices and stores), coffeehouses, equipment.	
Energy objectives	**Energy performance indicators**
• Reduce energy consumption by 20% in the company –operated stores by 20xx; • Purchase renewable energy equivalent to 100% of the electricity used in the global company-operated stores by 20xx; • Reduce the water consumption by 20% in all operated stores by 20xx; • Build all new, company-owned stores to achieve LEED certificate by 20xx.	• Direct energy consumption by primary energy source; • Energy saved due to conservation and efficiency improvements; • Initiatives to provide energy efficient or renewable energy based on products and services, and reductions in energy requirements as a result of these initiatives.

Source: Authors' research based on internal sources of the companies.

Action plans should be developed to address all of the organization's energy objectives and targets detailing how and when they are to be achieved, which will subsequently facilitate monitoring the progress in achieving the energy objectives and targets. The action plans should include schedules, resources and responsibilities for achieving the objectives and targets (see Table 5).

Table 5. *Action plan: Reduce energy consumption inside the company ABC*

Concerns	**Lighting in office building**
Target	To reduce the energy consumption for lighting by 10 per cent next year
Parameters	Energy consumption for lighting per employee in [kWh/employee]
Reference parameter	Yearly consumption
Required investment	700 euro
Value of savings	Approx. 414 euro/year
Pay-back time	Approx. 1,5 years
Avoided CO2-emisson	3.198 kg/year
Measures	1. Building awareness of the use 2. Stocktaking-review of lighting power at work places 3. Using energy saving lamps 4. Optimized positioning of lamps
Time frame	1. Until October 20xx 2. Until October 20xx 3. Until November 20xx 4. Until November 20xx
Person responsible, amount of work	1. Energy Manager –0.5 days 2. Company Tehnician-1.5 days 3. Company Tehnician-1 day 4. Energy Manager-0.5 days
Provision of expenditures	By energy efficiency team budget
Loss of work/production	None
Others	Reworking the lighting affects the working atmosphere positively The durability of energy lamps is higher than the traditional lighting devices.

Source: Internal sources of the company ABC.

Consequently, an effective energy planning will:

- Review energy use, consumption and efficiency at defined intervals;
- Document the methodology and criteria used to develop the energy review considering facilities, equipment, systems, processes or individuals;
- Establish an energy baseline;
- Identify energy performance indicators appropriate for monitoring and measuring it's energy performance;
- Establish, implement and maintain documented energy objectives and targets;
- Continually improve energy performance, including energy efficiency, energy use and consumption.

Conclusion

The current paper presents the essential steps the organizations should take to practically design a sustainable energy management system, by using the Plan-Do-Check-Act (PDCA) approach. It describes the approach that the companies should use to effectively develop and implement their energy planning and improve energy performance, starting from energy review and accounting for compliance with energy legislation, up to developing energy action plans. In the paper we exemplified how the companies establish their energy objectives and targets and how they define the energy performance indicators. An example of an action plan on reducing energy consumption is also offered.

The paper contributes to a better understanding of practicability of energy planning in an organization and supports energy managers/teams in their effort to design an appropriate energy management system in their organizations.

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Business models for state companies under the pressure of price uncertainty in the oil industry

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Abstract. *Business models are describing the architecture of the value creation, profit formula, key resources and key processes (Amit, R.H.; Zott, C.; Massa, L.,2010, Osterwalder, A.; Pigneur, Y.2010). In the oil industry the business models have a specific structure according to different parameter and has to be adapted for new market conditions. The objectives of the research that is disseminate within this article is to analyze and compare Iran and Iraq National oil companies' business models and to optimize the business models for state companies in the oil industry. The research methodology is focused on field research and two main case studies that compare business models of two of the most important oil production countries which experienced many changes during last decade and sometimes effects on the crude oil price globally because of their special situation like war or sanctions. The relevance of the study lies in the novelty of the subject of new business models for state companies in the oil industry, which have been scarcely investigated in the scientific literature and which represent a key element for the oil sector today.*

Keywords: oil price, business model, upstream, national oil companies, crude oil price, IPC

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Introduction

The theoretical concept of business model and the key elements, are described in various studies (Bruns, 2014; Daum, Gruber, 2002; Chesbrough and Rosenbaum, 2000; Morris, 2005; Richter, 2011; Shafer, 2005). Business models are describing the architecture of the value creation, profit formula, key resources and key processes (Amitet al., 2010, Osterwalder and Pigneur, 2010). Osterwalder and Pigneur (2010) proposed a typology that classifies business model elements into nine building blocks, namely value proposition, customer segments, channels, customer relationships, revenue streams, cost structure, key resources, key activities and key partnerships. According to Osterwalder and Pigneur, we can consider business model as a canvas structure and start drawing on it. It can be organized by the following sectors as consumer, resources and activities.

In the consumer segment we have channels, customer relationship and revenue streams which is the main income stream of the business. Resources segment is another end of the business model which is related to the key resources, key partners and cost structure and normally supply chain management is in this segment. The only segment which merely has internal connection with business is activity segment which includes key activities and value proposition.

For the business models in oil industry have been debated only by few studies. A first type of studies is focused on the oil supply chain, especially the upstream segment. This segment is analyzed through different characteristics, with large numbers of small and medium-sized enterprises (SMEs) that provide services and technology to support the operations of the major oil companies (Yusuf et al., 2014) . Another type of studies is focused on the administrative design of the oil industry.

In this Article, we proposed another approach that is focused on case studies related to business models in state companies. The comparative case study bring together the new National Iranian Oil Company methods of contract named as Iran Petroleum Contract (IPC) and the Iraq National Oil Company business model. The research methodology is based on field research and comparative case studies.

Iran and Iraq are among first 10 biggest oil and gas producers in the world and had the most increments of oil production during last 3 years based on OPEC annual report.

Important key of Iran is that Iran's global sanctions are going to be lifted, so Iran will enter to the market again by huge amount of crude oil production. Although it will face the market with more surplus, this issue is one of the most important opportunities for International Oil Companies (IOCs) to start investing in Iran's oil fields.

Aspects of business model in national oil companies (NOCs)

Players of the oil and gas industry upstream segment are national oil companies (NOCs) which are mostly independent. Based on conventional definitions, national oil companies hold the majority of petroleum reserves and produce the majority of the world's supply of crude oil.

According to Assessing "New" Upstream Business Models (Boscheck, 2006), three aspects need to be considered for oil and gas application.

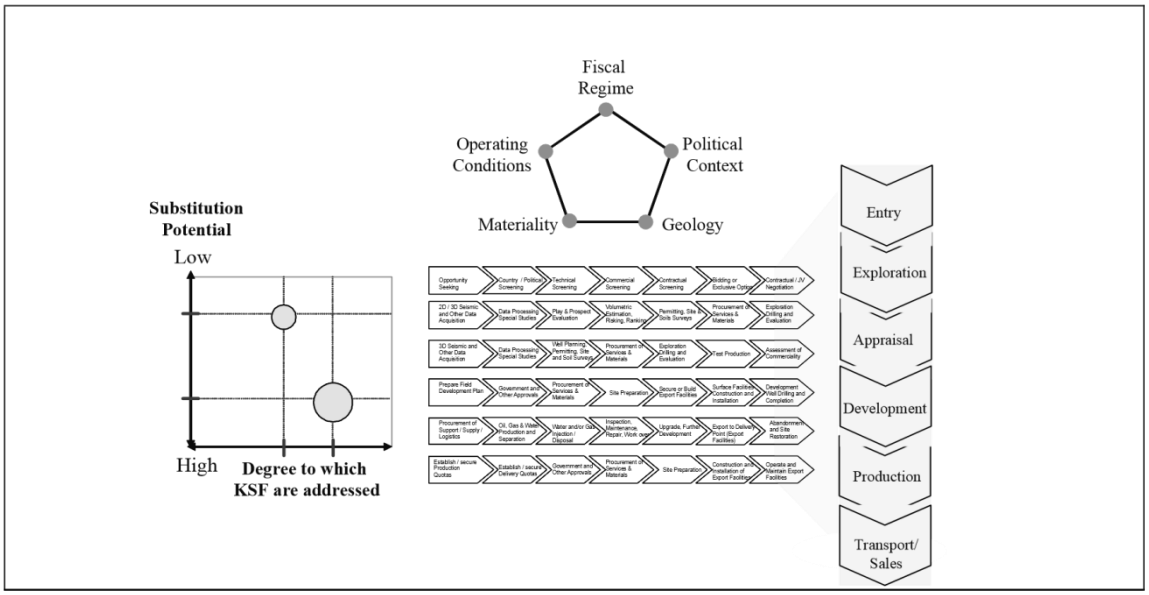

Figure 1. **Upstream Oil & Gas: Play Characteristics and Operational Reference**
Source: Boscheck, 2006.

First of all, *fiscal regime, political context, operating conditions, geology and materiality* evaluation, are mandatory for portray, according to Assessing "New" Upstream Business Models (Boscheck, 2006).

The second aspect is, as we cannot see finance in those 45 different items, operational role is considered. Outsourcing is also a good option when service providers and related operators tend to involve to control assigned tasks and liquidity.

The third aspect says that there is no fact that private owner or state owner could affect on operation. As in the market, value proposition need to use incentives, however explicit state direction, could be reduced by a suitable monetary and administrative system.

Case study Iran Petroleum Contract (IPC) and Iraq National Oil Company

In this paper we analyse the specific business models in oil companies, which are currently implemented in Iran and Iraq, as well as future investment intentions of oil companies by considering the political and regulatory standards in the two countries.

Our main objective is to provide an overview of the most frequently aspects of business model characteristics in oil industry in Iran and Iraq, as these factors contribute significantly to the future adaptation and development of companies in the field.

Secondly, the investments potential depending on the perception of investors on the two different oil environments in Iran and Iraq is analysed, in order to gain an insight into the current issues of both countries that are attributed mostly to legal supporting systems of oil field.

Financial aspects of business models in Iran and Iraq

The most important parts of each business model is fiscal part (Glomsrød and Osmundsen, 2005) which is revenue of each beneficiary as contractor and is the cost

structure of NOC's business model canvas. All those cost could support value proposition and generate revenue stream for NOCs by then.

The framework for this analysis in Iraq is based on Badra Development and Production Service Contract ("DPSC", 2009). New Iraq contracts era's financial part has three breakdown which are contract expenditure, contractor revenue and its return of investment method, petroleum and supplementary costs and remuneration.

As we can see in above mentioned expenditure criteria, all operational references which was addressed in figure 1, includes entry, exploration, appraisal, development and production should be done by contractor. These are key activities of contractor business model and also NOCs business model which will be done by outsourcing.

The reason of this kinds of outsourcing could be two main factor. One of them is lack of NOC's budget. Contractors in DPSC should speculate the contract budget for three years when they get the approval of their preliminary development plan and spend it in desired period of time.

The framework for the financial analyze in Iran is based on New Iran Petroleum contract (IPC) following range of operation is scope of the contract. All operational references which was addressed in figure 1, includes entry, exploration, appraisal, development and production that ought to be done by contractor. There it's a little bit different from Iraq and focused on more detail than Iraq contract. Here we can see even IOR or EOR and it could show us that Iran NOC has good enough information of their oil fields because they mentioned their requirements in detail in their IPC annexes. On the other hand, Iraq contract is an overall contract which ask contractors to participate in all required activity in which each fields must be done.

One of the most important issues which this criteria enforce to the contract is financial issue. The reason is that NOC will calculate contractor activity based on their prediction which they have to report to NOC before they start their activity in upcoming year. It could be a risk of contractors but Iran NOC compensate it by a great advantage in compare with Iraq contracts.

Ownership conditions in Iraq and Iran

Ownership of any products underneath any land is mineral rights it could be oil, gas, gold, coal and other metals and minerals. Extraction of these products is referred to this rights and could make change in terms and conditions of any extraction in various countries (Wolf C., 2009). Iran and Iraq also don't transfer any rights of minerals to IOC's and own all rights of minerals underneath lands which are in the scope of any contracts in their countries.

Another dimension of ownership was analyzed by Al-Obaidan and Scully (1991). In their study they estimate the efficiency differences between 44 international private and state-owned petroleum companies.

Despite of mineral rights similarity, Iran and Iraq contracts has some difference in ownership of equipment's which are under the terms of contracts.

In Iraq according to Badra's contract, all equipment's and assets which are used for the contract and petroleum operation will transfer to Iraq NOC except some assets which will import temporarily by NOC's approval and could re-export again.

On the other hand, Iran does not put any criteria on any tools and equipment which will be used in contracts and all those rights belong to IOCs. Iran also facilitate

their importation terms by exempt them from custom duties to prepare one more incentive for IOCs.

Participation in Iraq and Iran

Iraq handled participation in two phases. Phase one includes all activities from exploration to production and reach plateau. Phase two is the phase of production operation or petroleum operation which will start when the field's production will be stable.

Table 1. *According to Badra Development and Production Service Contract ("DPSC") dated December 24, 2009*

Project Phase	Partnership	Supervision
Exploration, Appraisal, Development and Production	The State Partner shall have twenty-five percent of Contractor's total Participating Interest. The Companies shall have entitlement to all Petroleum Costs and Supplementary Costs paid, while the State Partner shall be entitled to receive twenty five percent (25%) of any Remuneration paid.	The Joint Management Committee, shall nominate four members, including the chairman. Contractor shall nominate four members, including the deputy chairman, the secretary, and a member from the State Partner.
Petroleum Operation	A Joint Operating Company shall be formed within twelve months after NOC's decision to form the JOC. JOC shall be owned fifty percent (50%) by NOC and fifty percent (50%) by Contractor.	Board of director shall consist of eight members, four to be designated by NOC and four to be designated by Contractor, including one member from the State Partner

Source: Badra Development and Production Service Contract ("DPSC") dated December 24, 2009.

According to IPC, Iran's new types of contract includes following phases with mentioned criteria of joint participation in each phase. These kinds of assumed partnership are because of technology transfer and also utilize domestic oil and gas industry technicians to improve their knowledge and inflate experienced indigenous staffs after contract period.

Table 2. *Partnership and supervision methods according to IPC*

Project Phase	Partnership	Supervision
Exploration	Iranian competent companies subject to NIOC approval of their qualifications **may** be the partners to the operation.	Joint Exploration Committee (JEC). JEC consists of equal members of IOC/ JV and NIOC
Development & production	IOC will establish a joint venture with the Iranian competent company acceptable to NIOC. IOC's shares should not be more than 80% or less than 50 percent,	NOC

Source: Iran Petroleum Contract ("IPC") dated December 24, 2009.

Business Models in Oil Industry

Iran and Iraq are the example of these unconventional situation which is for their unique situation due to war and sanction while market slowdown is also the main testimony these days for all NOCs to rethink about their business models.

According to Paper from NPC North American Resource Development Study, U.S. Oil & Gas Industry Business Models (2011), four stages is considered to generalize business model in these kinds of business. Primary stage (*Prove it*) focus on geologic and reservoir potential and choose land for further action. In stage two (*Optimize it by trial and error*) contractors try to extract products and improve economics of well to an acceptable level. In stage three (*Standardize it*) the contractors should be chosen correctly to fund activities and avoid any stop start. Stage four (Rethink it) is facing with decreasing productivity and increasing cost due to saturation.

Value proposition as a new approach

In Iraq, value proposition and related innovation of its business model is long term contract with considering guaranty for payment and its cost of money after due date which is the most important part of any business.

In Iran, value proposition is more financial incentives while contract duration is good enough like Iraq and it is almost 20 years and more. Market slow-down and saturation with supply glut, forced Iran to propose more incentives than Iraq to join its projects. Iran is offering cost of money from the beginning day of project if it will be successful, tax exemption and avoid of paying custom duty are Iran's unique financial incentives as its innovation.

New stages for business model and how it works

Following items are some of new stages which are in Iraq business model.

Stage 1: The most important thing in this stage is financial ability as there is not enough cash flow in this stage and IOCs should compensate the cost of exploration from their other assets.

Stage 2: Knowledge is playing a major role in this phase that's why, Iraq tried to join knowledge proven IOCs to this contract and joint venture to guaranty this stage outcome and cost management.

Stage 3: Iraq choose well known company in knowledge and financial ability while established a joint company by NOC observation also should provide enough equipment to produce constantly and decrease OPEX and CAPEX, that's why NOC decided to exempt those paying custom duties to facilitate importation procedure.

Stage 4: It's time to transfer operation to NOC and local companies.

Here is some information related new stages of Iran business model

Stage 1: Same as Iraq, Iran also ask for IOCs with good financial abilities which should be proven by international financial organization then IOC could join to the tender. One more trigger is that Iran will not pay anything to the IOC if exploration is not successful. On the other hand if IOC is successful, Iran will pay cost of money from the beginning of contract which is the most important incentive to motivate knowledgeable IOCs with good financial background enter to the market.

Stage 2: As earlier mentioned in stage 1, Iran thought about all prerequisites which should be considered to choose IOCs with great knowledge regarding exploration

and its new technologies to be successful and also NOC will observe them during the contract.

Stage 3: As this stage required to avoid any barriers, Iran decided to facilitate it by some financial incentives which are tax free activity and custom duties exemption while IOCs also will not think about social which will pay by NOC.

Stage 4: In this stage Iraq is doing better than Iran because Iraq will have enough assets to continue production but Iran does not have any condition in its contract to transfer all assets to Iran after contract, so they will have trouble or an idle time to prepare enough resources again.

Conclusions

According to above content, operational activities of oil and gas business model are entry, exploration, appraisal, development, production and finally sales and transport. Iran and Iraq both assume all those activities in their contracts as mentioned above.

In this case, we cannot see any major difference between Iran and Iraq operational part of business model and both of them cover all aspects like entry, exploration, appraisal, development and production. Sales and transport have different characteristic which cannot be assumed in the contract by IPC. Iran and Iraq handle those activities by their internal department which is a part of key activities of Osterwalder business model canvas.

Iran and Iraq promote value proposition through innovation by long term contract and facilitate terms and conditions of contract by creating a joint company with some share of NOC to could move forward easier with NOC authorization while IOC is leading the company. This joint company will differ in each phase of business model. For instance in exploration phase Iran does not insist on joint venture but in operational phase especially in plateau situation, NOC play a major role and force IOC to use Iranian engineers and train them for following phases. They also furnish themselves for project handover by these kinds of joint companies in previous phases.

As explained above, market slowdown and lack of liquidity for NOCs and even IOCs forced Iran to offer more incentives in their new contract and absorb more IOCs to enter to their market and move forward their Oil and Gas industry which is now some step backward from other neighbors or competitors.

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The influence of renewable energy on the Romanian energy future market design

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Abstract. *Even though the trend in the energy sector is to be more environmentally friendly, the path which will lead us to our aim of having 100% green energy is not easy and has to be taken with big precautions. The governments have to work closely with the investors to find the best options to implement technologies for renewable energy without jeopardizing the energy security and by proposing realistic and sustainable targets for the state and final consumers. An efficient relationship based on mutual benefits for all parties will boost the delayed privatization process of the Romanian energy sector. This paper examines how the renewable technologies influenced the Romanian's electricity market and what should be done in the future so that there would be a good coexistence between renewables and traditional technologies until, in a faraway future, there will be somehow only renewable energy in the grid.*

Keywords: renewable energy, Romanian energy market, energy policy, Romanian electricity market, electricity power load curve, energy mix, energy security

Introduction

The attention upon the impact on environment in the energy sector has not been always as big as it is nowadays. Policies in this domain were mostly taken at a national level at not at a Union level if we speak about European Union. For example, in the European Union, the Treaty of Rome (1957) and even the Lisbon Treaty (2007) specify that the energy should be treated as a national competence. As a response to the massive increase of environmental problems, the European Union created a common energy policy which each member state should respect and fulfill its targets. The policy includes statements such as until 2020 each member state should have at least 20% renewable energy in its energy mix. Also, the European Union is involved in research and development in the energy sector by funding different programs which will create newer technologies in this domain or update the old ones. The paper will analyze the development of the Romanian energy sector since the introduction of renewables and in the conclusion there will be recommendations that can help the future decision takers to make Romania a better place for investments, to help the final consumers have a better price/quality ratio and also to develop a safe and stable energy system.

Background

In Romania, a very important decision in the energy sector was taken in 2008 when the government introduced the green certificates system. The green certificate is a title which attests the production of electricity from renewable sources of energy. This certificate can be traded, separately from the quantity of electricity it represents, on an organized market, according to the law and it represents the support scheme to promote the renewable energy production. Each MWh of green energy which is produced by renewables is being rewarded with a number of green certificates. After that, the green certificates are bought by electricity suppliers, the supplying companies being obliged to have in their energy mix, a quota of green energy. In this way, Romania tried to attract investors in the green energy sector.

When implementing this support scheme, the Romanian government also had to select which sources will be eligible for green certificates. In law 220/2008, the number of certificates for main types of renewable energy was stated:

- Hydroelectric power plant with an installed power of minimum 10MW – 3 green certificates/1 MWh produced and delivered, if the plant is new and 2 green certificates/1MWh produced and delivered if the plant is upgraded and 1 green certificate/2 MWh if the plant has no more than 10 MW installed power
- Wind power plants – 2 green certificates/1 MWh produced and delivered until 2017 and 1 green certificate/1 MWh produced and delivered starting with 2018
- Geothermal and mud fermentation gas from the cleaning installation of used waters – 3 green certificates/1 MWh produced and delivered
- Solar power plants – 6 green certificates/1 MWh produced and delivered

For protecting both the producer and consumer of electricity, a minimum and maximum price was established for the green certificates as follows: the minimum price was 27 euro/certificate and maximum price was 55 euro/certificate. Also, compulsory annual quotas of green certificates were established as follows:

- 2008 – 5.26%
- 2010-2012 8.3%
- 2013 9%
- 2014 10%
- 2015 10.8%
- 2016 12%
- 2017 13.2%
- 2018 14.4%
- 2019 15.6%
- 2020 16.8%

Everything looked good on paper and not only as in 2008 and 2009 there were huge investments in the energy field in Romania. The foreign investors flooded Romania to build renewables, the Romanian investors started to find out about this and applied for credits to the banks and the quota of 20% until 2020 started to look tangible for Romania. Even the banks which are making severe analysis of businesses before they fund them, started to provision full investment return in 5-6 years which is almost impossible in this domain in other countries. With everything being very good in the energy sector, the money flooding into it, nobody was taking into consideration the fact that the number of certificates was or wasn't too big to be sustained by the state.

The unstable political environment, the best example being the Romanian government with 3 cabinets (2008-2009, 2009-2012, 2012-2015) and a review made by ANRE (Regulatory Authority for Energy) had as a result major changes in the green certificates scheme.

The 2012 revisal of law 220/2008 became a turning point for the energy sector and for the investments in renewables in Romania.

"Overnight", ANRE decided that in order to avoid the overcompensation in this scheme, there should be some reductions in green certificates as it follows:

- Wind power plants – new wind power plants from 2 green certificates/1 MWh to 1.5 green certificates/1 MWh until 2017, old wind power plants from 2 to 1.3 green certificates/1 MWh until 2017 and 1.25 green certificates/1 MWH from 2018
- Hydro power plants smaller than 10MW – from 3 to 2.3 green certificates/1 MWh
- Solar power plants – from 6 to 3 green certificates/MWh

With these huge changes, the major ones being for solar photovoltaics, the investments in renewables drastically fell and also protest from the existing power plants owners started. They're complaints were that they made a business plan for 15-20 years and now their whole business plans became null, because of this big change in legislation. The ones that took money from the banks started to blame the state for not being able to pay their loans. This problem which occurred in Romania showed that a law, even if it looks good at start, can become bad in time if it isn't professionally developed. Introducing this support scheme, helped Romania to get over the recession better than other states by benefiting from the investments in the energy sector. But being driven by the urge to attract investors in our country, the governors were too generous and didn't take into consideration how much the state can support. After a few years, ANRE realized the situation and suggested the Government to make the drastically cuts in green certificates.

Method of specific investigation

To find out how the Romanian electricity market was influenced by renewables, data was taken from Transelectrica and Opcom.

Transelectrica is the Romanian Transmission and System Operator (TSO) which manages and operates the electricity transmission system and provides the electricity exchanges between the eastern and central European countries as a European Network of Transmission and System Operators for Electricity member. Also, Transelectrica is in charge with electricity transmission, market and system operation and grid and market infrastructure development ensuring the security of the Romanian power system.

Opcom (Romanian gas and electricity operator) fulfills the role of the electricity market administrator, providing an organized, viable and efficient framework for the commercial trades' deployment on the wholesale electricity market and performs administration activities of the centralized markets in the natural gas sector.

Both of these entities provide monthly and yearly reports from which the data has been taken. Data includes information about the installed capacity and available power of each type of power plants, about the energy curve which includes the supply curve divided by types of power plants and also about the evolution of MWh prices in Romanian electricity market.

Analysis of results

First of all, the energy mix will be analyzed to find out how the Romanian electricity system is influenced by the renewables. The graphs compare the values between year 2009 and years 2015-2016, in summer and winter and also during the day and during the night.

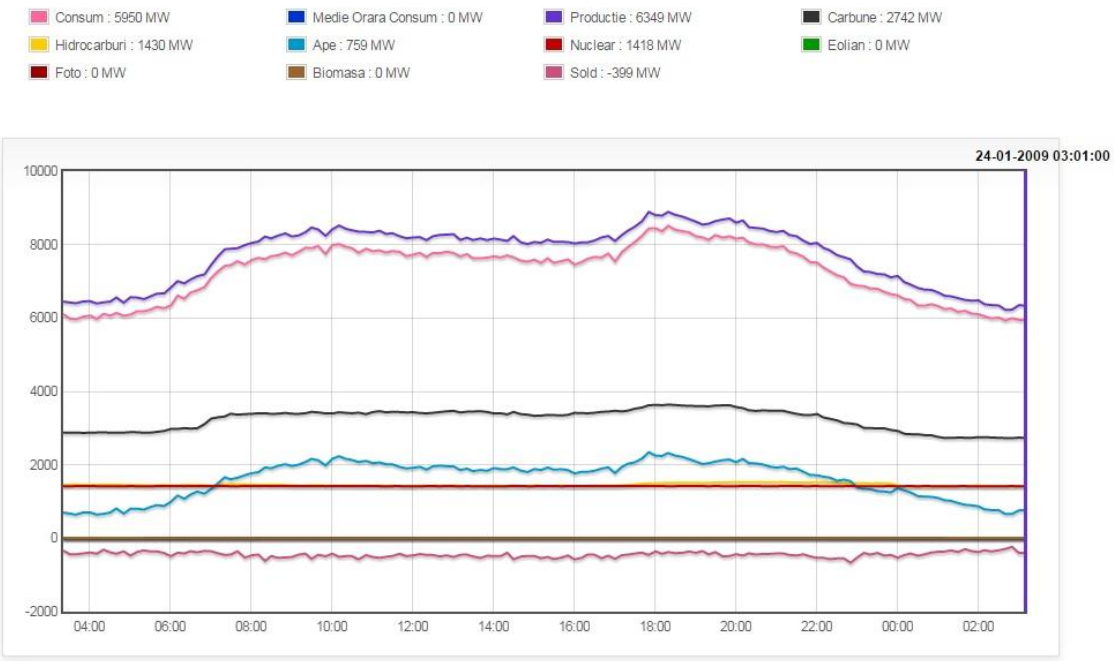

Figure 1 **Energy Generation and Consumption Curve – 24.01.2009 – 03:01 (night) (Transelectrica, 2009)**

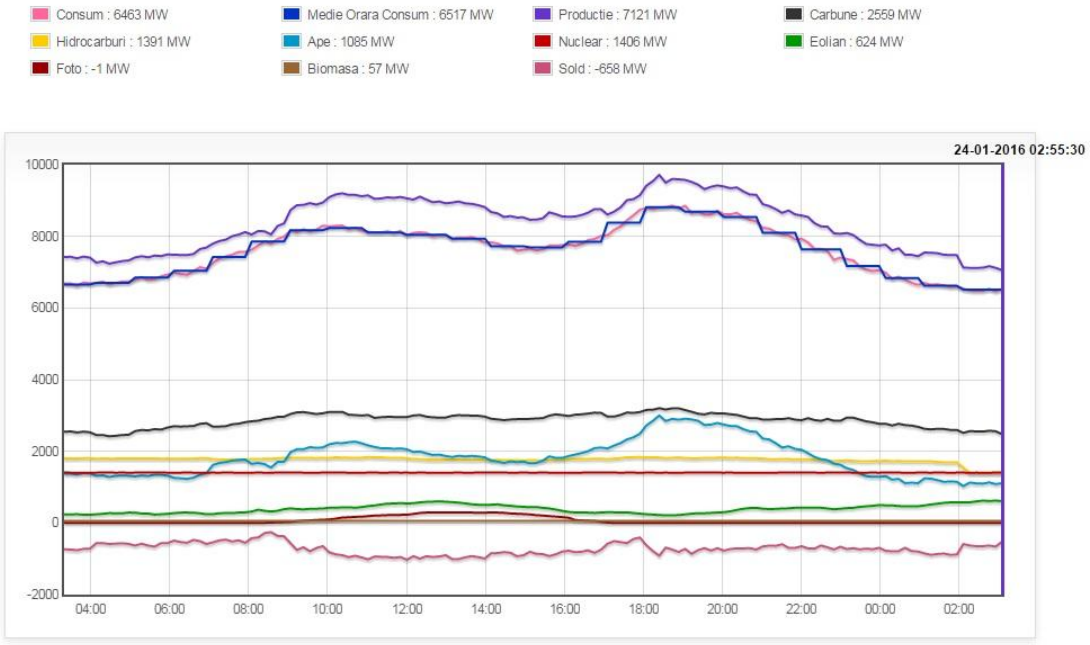

Figure 2. **Energy Generation and Consumption Curve – 24.01.2016 – 02:55 (night) (Transelectrica, 2016)**

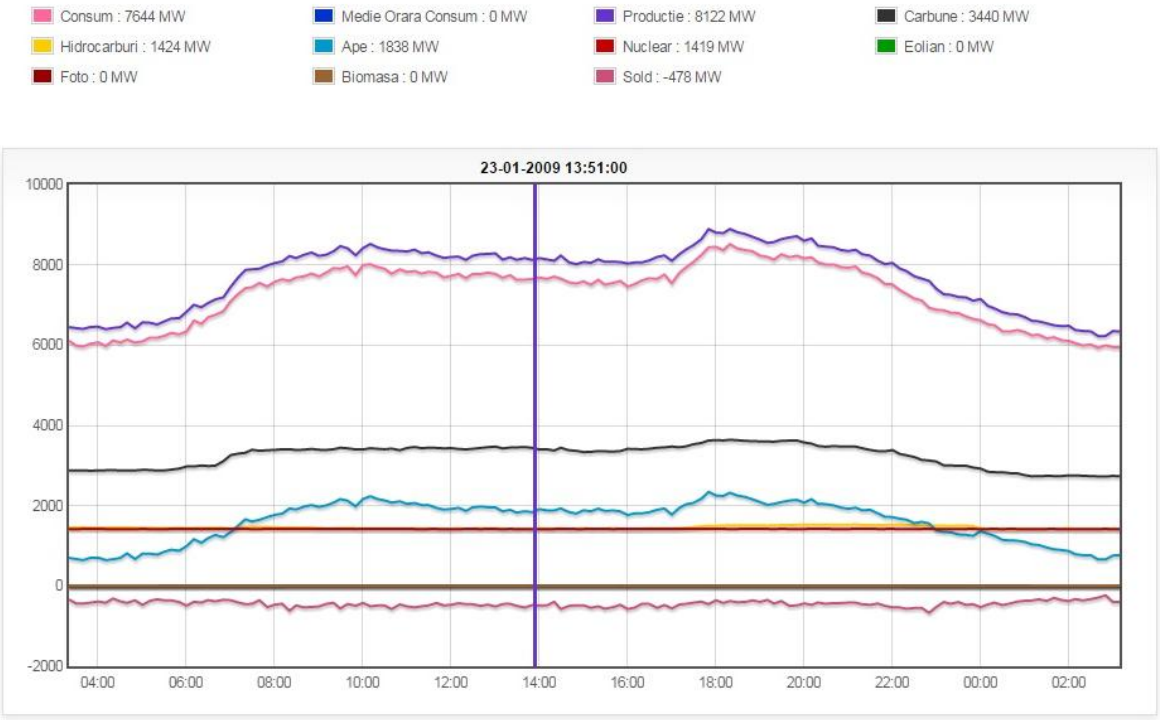

Figure 3. **Energy Generation and Consumption Curve – 23.01.2009 – 13:51 (day) (Transelectrica, 2009)**

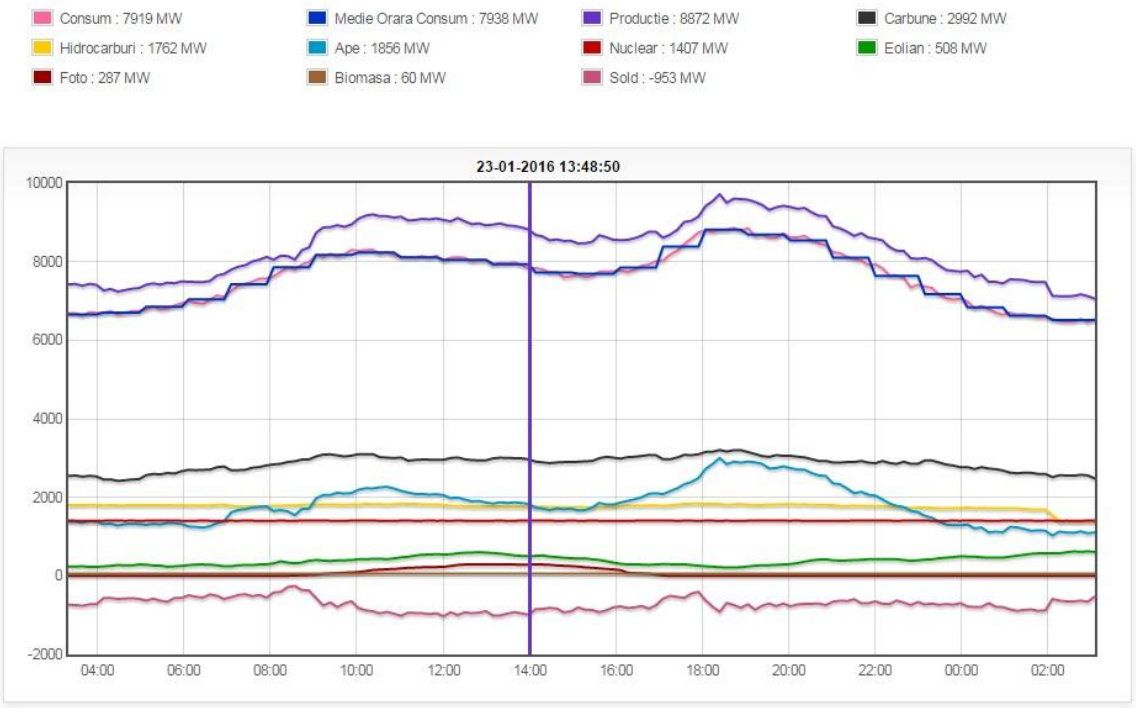

Figure 4. **Energy Generation and Consumption Curve – 23.01.2016 – 13:48 (day) (Transelectrica, 2016)**

In Figure 1, which is presenting the situation in January 2009, when the green certificates system was just launched, it can be seen that from Biomass, Wind and Solar source there was actually no contribution to the system. Even without zero contribution from these types of renewables, the demand was already smaller than supply during the night. After 7 years, in 2016, when the renewables are having an important market share in Romanian electricity market, the gap between demand and supply is even bigger, the system having a negative value of -658 MW compared with -399MW in 2009. The difference between -399MW and -658MW is even bigger than it firstly appears, because of the difference in temperatures and consumption. In 20-25 January 2009 the medium temperature in Romania was bigger than the normal values, but in 20-25 January 2016 the medium temperature in Romania was significantly smaller than the normal values, most of the counties being under an orange warning of cold weather. Even though the consumption increased with almost 1000 MW, the rate of increase of supply was even bigger majoring the gap.

Figure 3 and 4 illustrate the bigger gap between the negative value from 2009 and 2016, because during the day, the solar PVs produced also. Even though the renewables produced a considerable amount of energy, the supply cut from traditional power plants was only for coal which decreased with almost 500MW, which can be replaced by what the wind power plants produce.

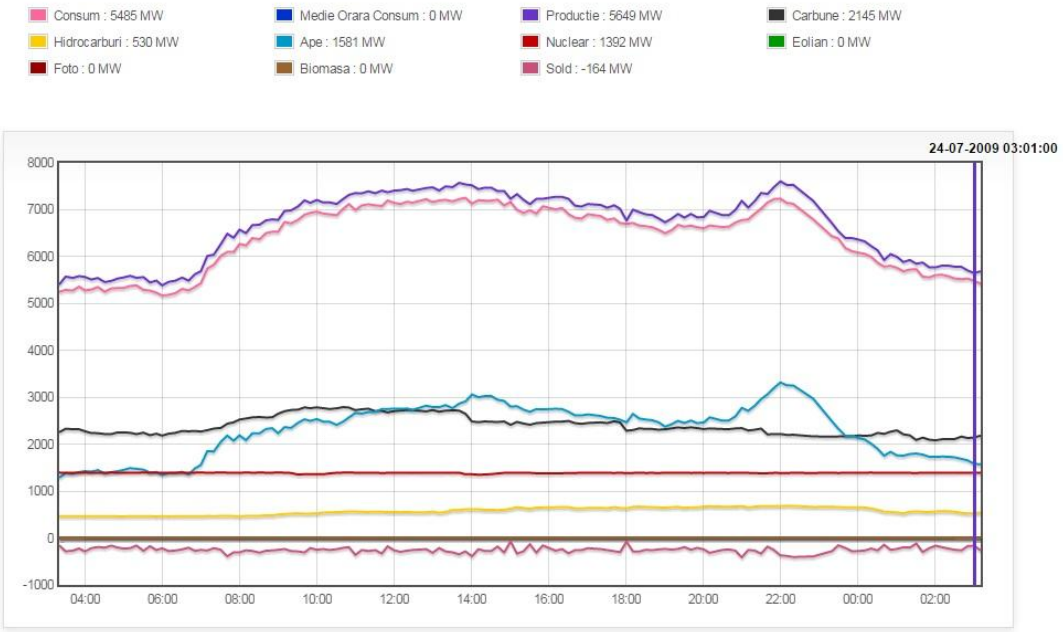

Figure 5. **Energy Generation and Consumption Curve – 24.07.2009 – 03:01 (night) (Transelectrica, 2009)**

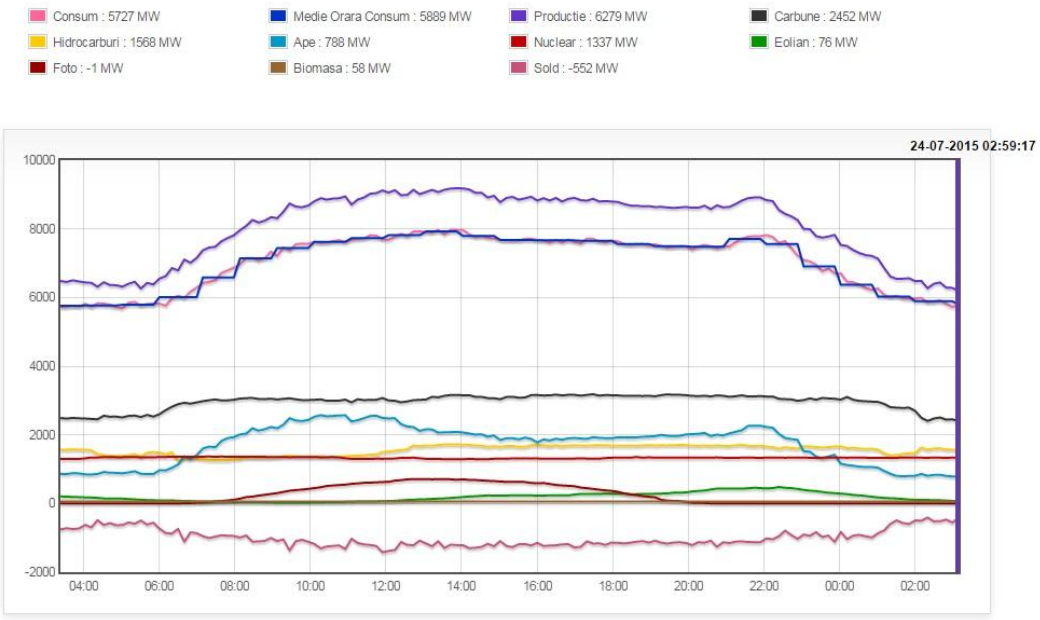

Figure 6. **Energy Generation and Consumption Curve – 24.07.2015 – 02:59 (night) (Transelectrica, 2015)**

Figure 7. **Energy Generation and Consumption Curve – 23.07.2009 – 13:51 (day) (Transelectrica, 2009)**

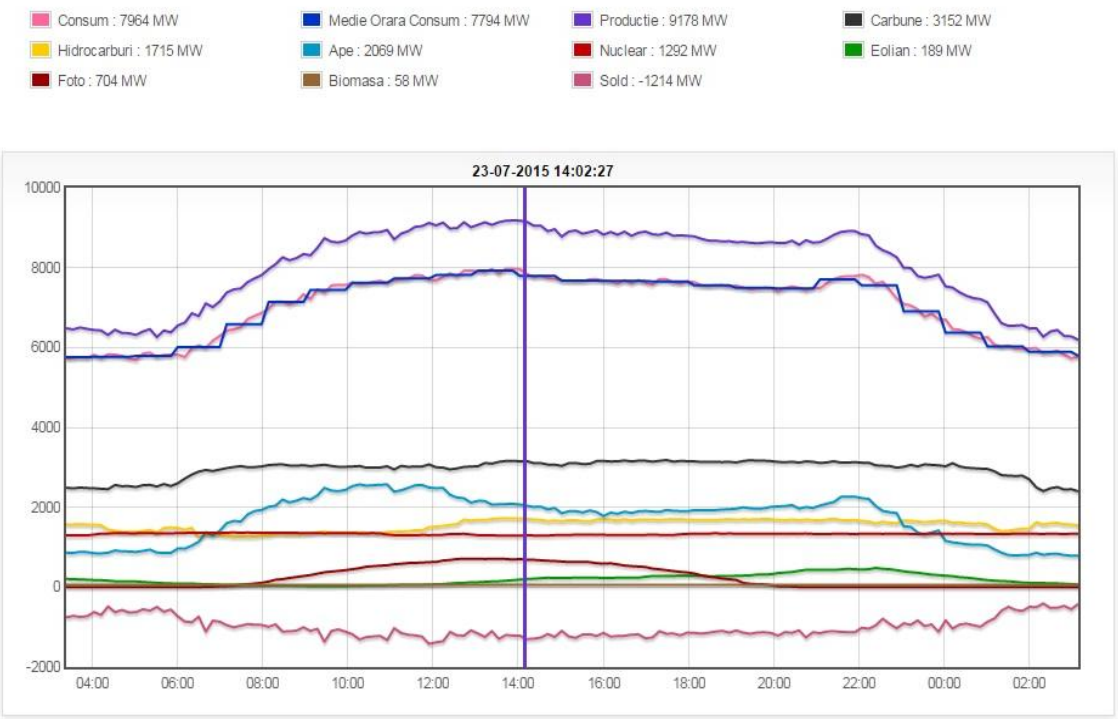

Figure 8. **Energy Generation and Consumption Curve – 23.07.2009 – 14:02 (day) (Transelectrica, 2009)**

For a better understanding of the energy generation and consumption curve, values for summer time for both night and day were compared between 2009 and 2015.

The month of July was chosen, because there were the same conditions in terms of meteorological conditions, both summers being dry with high temperatures.

During the night, the renewables didn't help too much the system and there was a need of increase in the traditional power plants mostly in coal power plants. This demonstrates that the renewables, without an important contribution from Hydro power plants (hydro was almost 1000MW smaller in 2015 than 2009 so that there was the necessity for increase in coal) can't help the system very much in some situations and that the energy mix is a must.

During the day, an interesting fact can be seen: in 2015, because of the fluctuations in solar and wind, the gap between supply and demand was almost 1000MW bigger than in 2009, which shows a problem of the renewables. The problem is that they are hard to predict and can destabilize the system and even overload it sometimes.

The behavior of the Romanian electricity system shows that in order to have a safe and stable system, conventional power plants are still needed.

For a clear picture of the investments in renewables in Romania, data from Transelectrica has been taken and transformed into graphs.

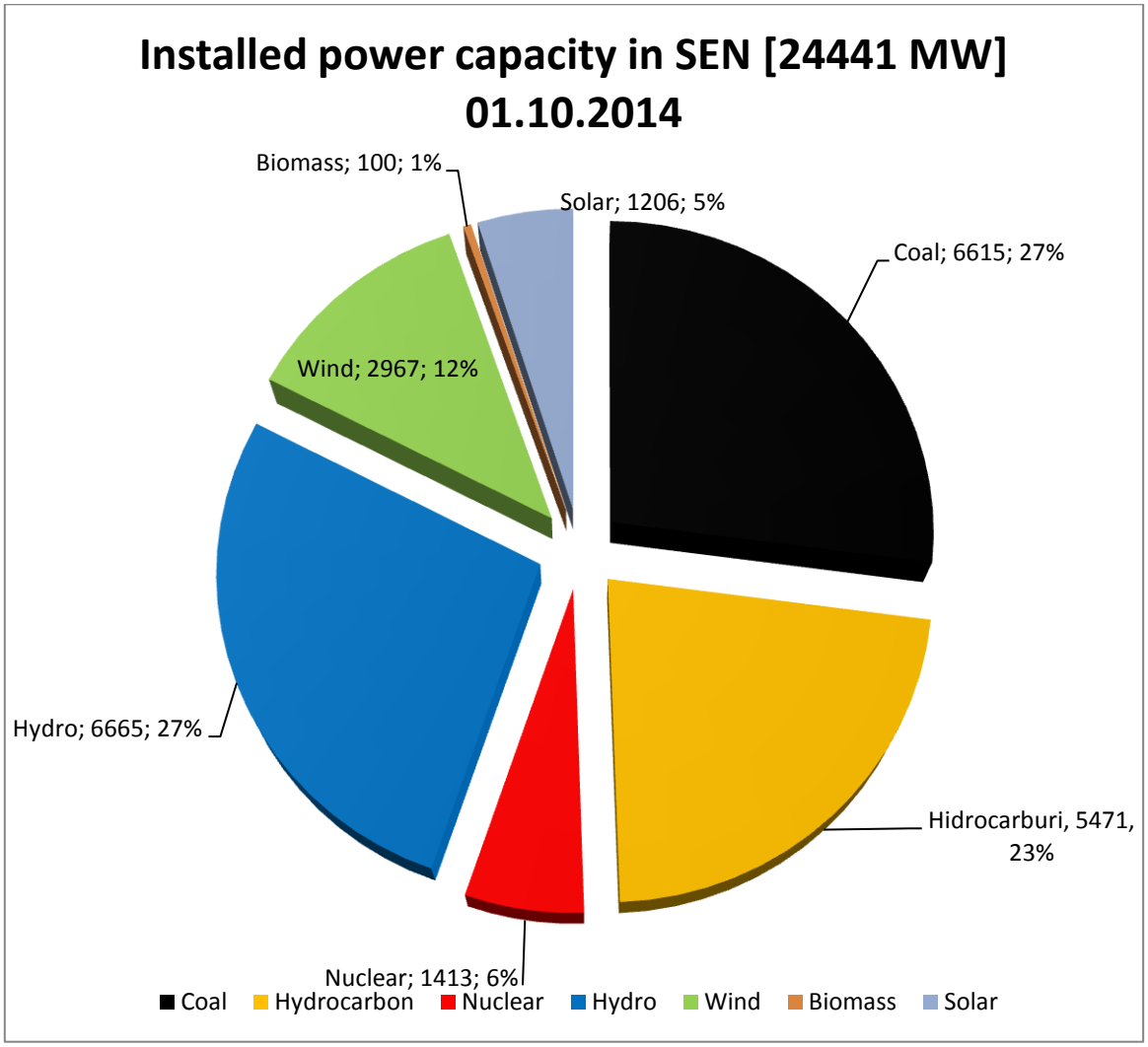

Figure 9. **Energy Mix in Romania in 01.10.2014 (Installed Power Capacity) (Transelectrica, 2015)**

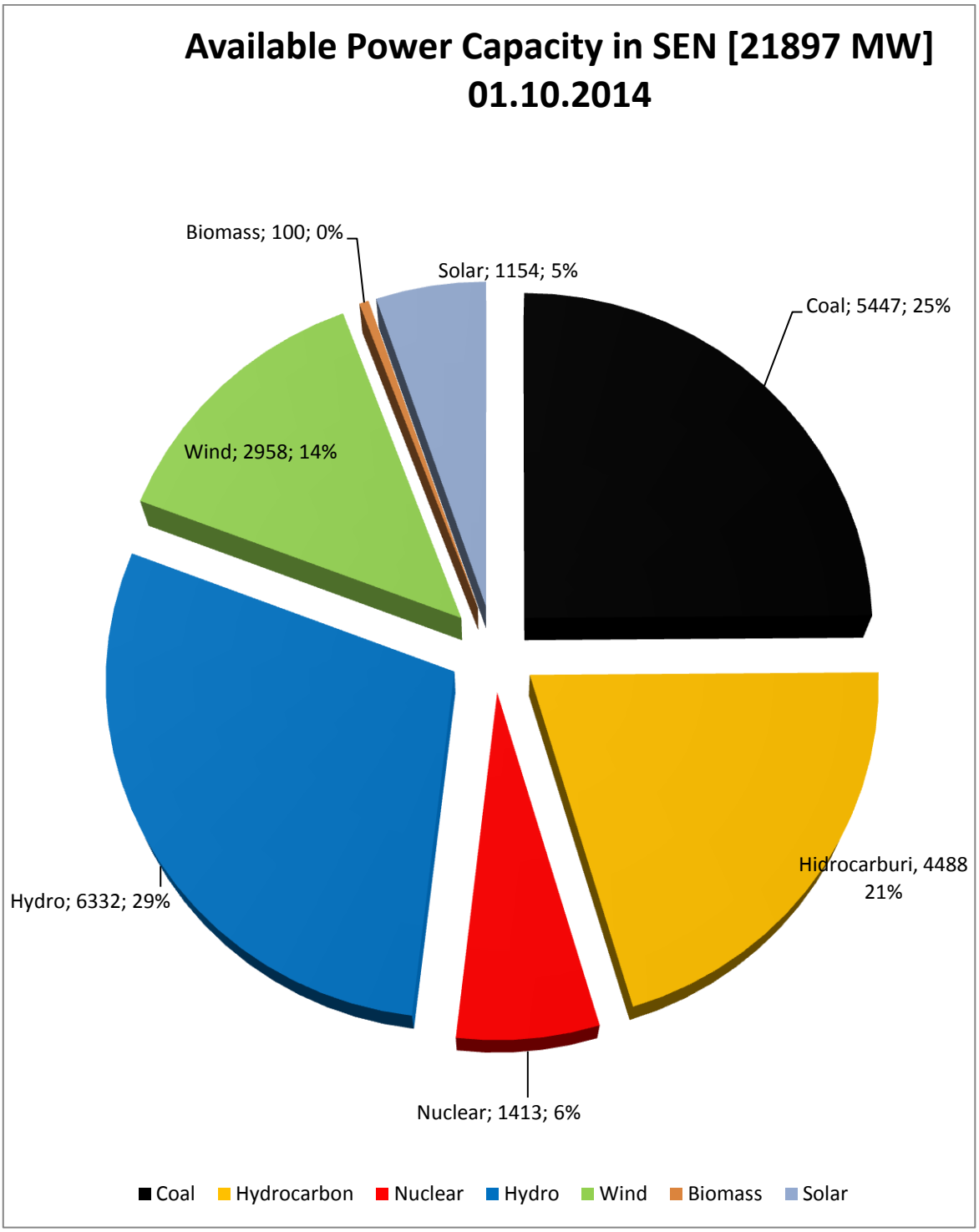

Figure 10. **Energy Mix in Romania in 01.10.2014 (Available Power Capacity) (Transelectrica, 2015)**

Figure 9 and figure 10 show the energy mix in Romania and the difference between the installed power capacity and the available power capacity. In 2008-2009, the wave of investments in the renewables sector in Romania due to the measures taken

by the Romanian government with the green certificates was so considerable that after only 5-6 years, in 2014, the installed power of wind-solar-biomass had a market share of 18%. The market share of renewables (wind, solar and biomass) is even bigger in available power capacity counting for 19%. After fulfilling EU requirements of 20% green energy by year 2020, 6 years earlier, Romania faces the issue of system stability and also needs investments in the transmission system, in smart grid and metering so that the renewables will become an advantage for Romanian electricity market and not a downside.

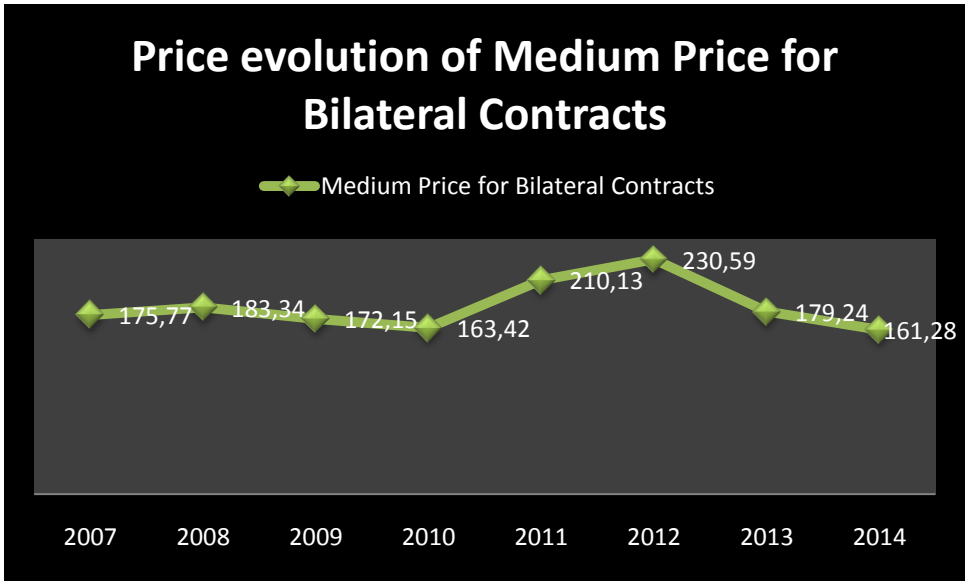

Figure 11. **Price evolution of Medium Price for Bilateral Contracts (OPCOM, 2007-2014)**

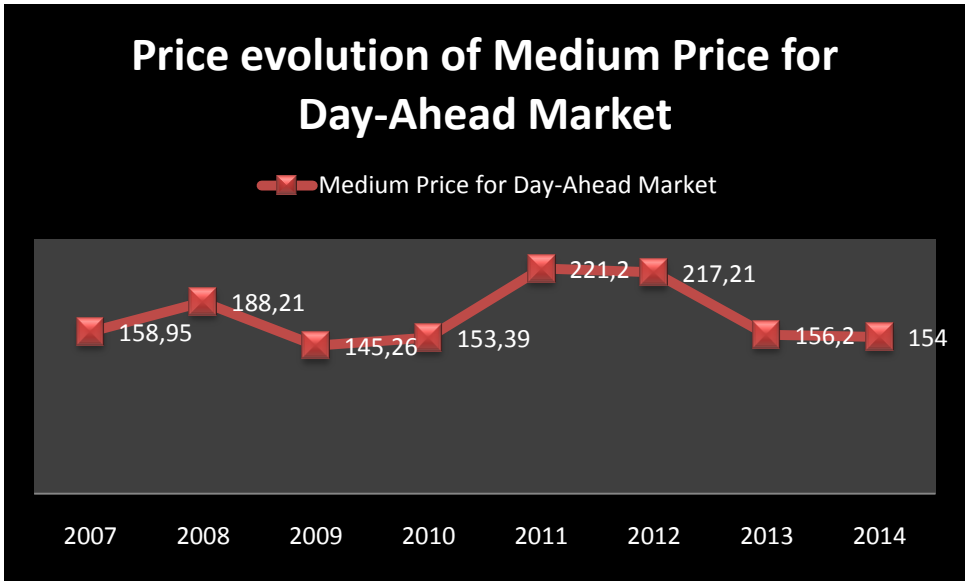

Figure 12. **Price evolution of Medium Price for Day-Ahead Market (OPCOM, 2007-2014)**

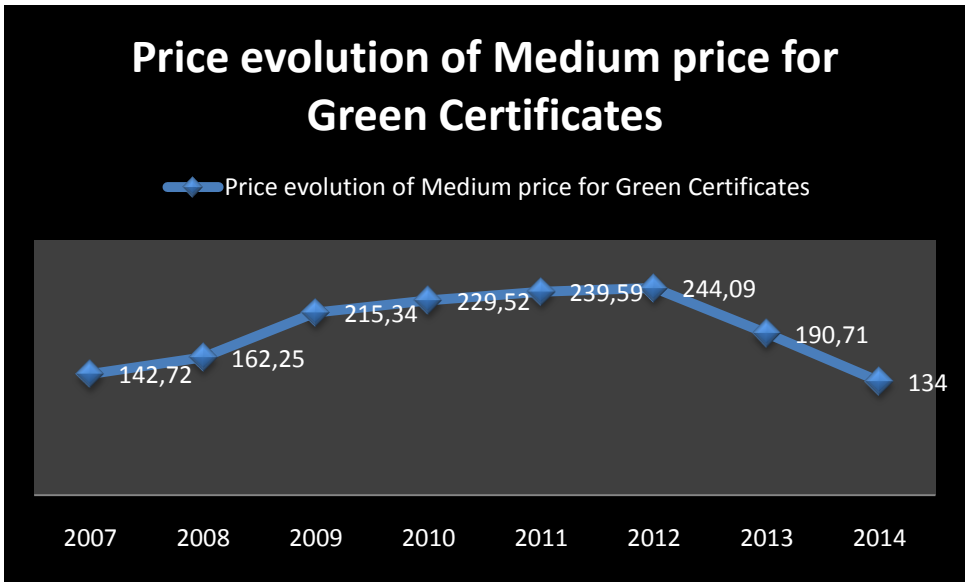

Figure 13. **Price evolution of Medium Price for Green Certificates (OPCOM, 2007-2014)**

Figures 11-12-13 present graphs of the evolution of prices in Romanian electricity market, the data being taken from Opcom annual reports. Taking into account that in 2008 the Government announced the launch of the green certificates support scheme, the investments in renewables sector in Romania directly influenced the Romanian electricity market. Between 2010 and 2012, when most of the investments started in 2008-2009 were finalized and ready to generate energy, the prices for Bilateral Contracts, Day-Ahead Market and Green Certificates exploded. This positive evolution hasn't been felt by households for example, because the Romanian electricity market was still mostly regulated. In 2012, when ANRE discovered that the green certificates scheme couldn't be supported in its initial look by the state, the Romanian electricity market started to halt and the impact was mostly on the households. The exemption of some big consumers from buying green certificates directly hit the households' electricity bills, where a certain percentage went for the green certificates. Even If it had its "glory years", the green certificates support scheme is sinking more and more nowadays, the price for one certificate being almost half of how much it was in 2010-2012. Even if the prices for electricity in general, including the bilateral contracts and day-ahead market are decreasing, the households are not feeling this, yet, in their invoices. Liberalizing the market shows great promises and this might be the adequate shift that can improve the price/quality ratio for electricity for the final customers.

Conclusion

Romania's electricity market is in a continuous evolution, with its advantages and disadvantages. A sure fact is that the energy sector in Romania is becoming greener and greener and that even an Eastern European country with almost zero renewables 8 years, ago, can become an important regional player in a relatively short time. The period of 2008-2015 reveals that the politics and the energy sector are strongly related and that every measure taken at a governmental level has to be taken with big precautions and each step should be calculated and not taken spontaneous. Also, the

relationship between the dominant political parties in Romania is very important for the future of this country, because taking measures in contradiction every time the government is changed will lead to instability and will scare the potential investors. An unstable legal system discourages the investors, because the energy sector is a domain in which the business plan is made from the beginning on a long-term which is directly affected by the legislation and the political environment in a country.

Another conclusion that can be drafted is that taking measures just to attract investors as it happened in Romania in 2008, but not being able to sustain them on a long-term, is the sign of a poor management. The benefit made on a short-term will be replaced by the much bigger loss on a long-term. Romania didn't just lose investors now, but also lost future investments, because it isn't anymore a trustworthy political and legislative environment.

The overload of the system needs to be taken into account and the investments in transportation and metering should be a must for Romania. Having a percentage of over 20% renewables in the energy mix, Romania should prepare itself for the conditions these types of plants require, because the supply will vary a lot more than in the past and the prediction needs to be more accurate.

Until the transportation and metering are upgraded, the Romanian legislation needs to be updated too, in order to protect the Romanian energy system. A system of negative prices is needed as the renewables gain more and more market share in Romania. The negative prices is a concept in which the flexible producers (renewables) actually pay the customer for buying the electricity, because it can actually be less expensive for them than shutting down the plants. For example this can help during the night, when sometimes the wind power plants come with an influx of electricity in the system when there is no need.

The green certificates should also be revised until a new support scheme will come up: the expiration date should be canceled, because nowadays they have one year expiration date. Also, another improvement could be the beginning of trading Green Certificates on the Stock Exchange Market like a normal commodity; by this the problem of inexistent demand can be solved.

In conclusion, in order to avoid future losses in the energy sector development, Romania's officials should carefully evaluate the situation, the evolution of the market until now and take measures that will benefit the country's market on a long-term and not only on a short-term like in the past.

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The Azerbaijan-Georgia-Romania Interconnector (AGRI): present and perspectives

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Abstract. *In a world dominated by geopolitical, economic and political uncertainties, energy security has become a priority. One of the main objectives of EU energy security is the diversification of gas supply. The utilization of the transit capacity of the Black Sea region is an essential step for its economic development and energy supply to Western Europe and south. The project Azerbaijan-Georgia-Romania Interconnector (AGRI) was proposed in the list of projects of common interest in the European Union, through the economic and strategic interests in the region. This paper aims to present a brief summary of the A.G.R.I project development in the context of contemporary challenges to global energy security. We aim to identify the main problems and threats faced by the project, in terms of economic reliability antithesis - geostrategic interests. The methods used in preparing the article are documentation, analysis and synthesis. The sources of information identified relate mainly to official sources, press releases, and to a series of studies about geopolitical architecture of a wide region of the Black Sea. Our opinions and interpretation about the AGRI project can become a useful support in understanding the main facts affecting the decisions in Romanian Energy Security aims.*

Keywords: A.G.R.I LNG, natural gases, liquefied natural gases, Black Sea

Introduction

The problem of energy security is one of main concerns for the countries in NATO and the European Union and is a very researched topic. Basically, we can speak of two methods to approach the problem:

The first one is referring to the alternative sources and routes of delivering oil and gases (network of pipelines, alternative projects for supplies and support for the newest projects).

The second approach is considering the interdependence of the suppliers and consumers in both the upstream (participation in the production of the consumers) and in the downstream (equal participation in the distribution of the suppliers) (Chifu, 2011).

For some specialists in the field, energy security means to be ensured in terms of resources, control of the routes and distribution and alternatives. In general, the concept is defined as "secure resources at a reasonable price" (Proninska, 2007). In another view, energy security means the necessary production of energy in the respective country, and a minimized dependence on imports. But the realities of the current era have shown that large consumers should renounce the energy independence utopia and accept the energy interdependence (Băhnăreanu, 2008).

Energy policies are viewed today as measures that states or groups of states take towards ensuring security of energy supply, competitiveness of the energy industry and also environmental protection. Such a framework involves the need for a conscious cooperation between the different "energy players" (the state, energy companies or consumers) to overcome some difficulties related to these three components. A modern energy policy, clear and transparent, has to ensure a balance between the three objectives, managing to avert the appearance of some undesirable aspects, such as energy crises and to ensure price stability in this sector and the continuity of supplies to consumers (Codoban, 2012).

Europe is facing a shortage in the supply of energy resources and new transport routes are designed to eliminate this deficit and to meet growing consumption requirements.

The utilization of the transit capacity in the Black Sea region is an essential step for its economic development and energy supply to Western and Southern Europe. Creating new routes for increasing transport capacity of oil and gas in the Caspian Sea basin is a requirement in terms of economic development of the region and would meet the high consumption requests and the need for energy security of European countries.

In the region there are major producers (Russia and Azerbaijan), important transit countries (Georgia, Turkey, Romania, Bulgaria, Russia) and consumer countries (Georgia, Turkey, Armenia, Ukraine, Republic of Moldova, Bulgaria and Romania). (Chifu, 2011).

According to forecasts, at the EU level there will be a growing dependence on natural gas imports from 57% in present to 84% in 2030. Therefore, the long-term energy policy of the European Union must take account of the need of significant investment in its energy infrastructure, which has to contribute to the security of gas supply to Europe (http://www.agrilng.com/ro).

For all European Countries, the so called Southern Corridor is of tremendous importance for energy security. This means alternative sources and alternative routes of supply, meaning a way out for Caspian energy, other than Russia's monopolistic route (Chifu, 2011).

Natural Gas Energy Situation in Extended Black Sea Area

In the wider Black Sea area, several countries dispute their supremacy in the energy field, each of them wishing for an important role in the production or distribution of gas / energy infrastructures. Regarding the countries involved in the project AGRI, they have convergent interests, yet project developments depend on a number of elements of ongoing geopolitical policy, whose purpose is far from clear.

Azerbaijan is one of the main natural gas producing countries in the region. The main resources identified are located in the *Shah Deniz Ore*, having as shareholders: BP (technical operator), Statoil (Norway), Naftiran Intertrade Company (NICO - Iranian oil and gas company based in UK), Total (France), LukAgip (joint venture Lukoil Russia - Agip Italy), TPAO (the Turkish national oil company and gas) and SOCAR (Azerbaijani state company) (http://www.bp.com/en).

The Shah Deniz (SD) field was discovered in 1999. It is one of the world's largest gas-condensate fields, with 40 trillion cubic feet - over 1 trillion cubic meters - of gas in place. It is located on the deep water shelf of the Caspian Sea, 70 km south-east of Baku, in water depths ranging from 50 to 500 m.

Shah Deniz Stage 1 began operations in 2006. It has the capacity to produce around 10 billion cubic meters of gas per annum (bcma) and approximately 50,000 barrels a day of condensate.

During 2014, the existing Shah Deniz facilities were further de-bottlenecked which increased their production capacity from 27.3 million standard cubic meters to 29.5 million standard cubic meters of gas per day.

In the first nine months of 2015, the field produced 7.2 billion standard cubic meters (bcm) of gas and 1.66 million tons (about 13.4 million barrels) of condensate. (http://www.bp.com/en)

Officially, as BP declare, Shah Deniz Stage 2, or Full Field Development (FFD) is a giant project that will add a further 16 billion cubic meters per year (bcma) of gas production to the approximately 9 bcma produced by Shah Deniz Stage 1.

This will enable the annual delivery of an additional 6 billion cubic meters (bcm) of gas to the Turkish market by 2018, and a further 10 bcm to consumers in Europe by 2019. Both the EU Commission President and the EU Energy Commissioner attended the ceremony together with the Azerbaijani President. EU Commission President declared that the occasion marked a "major milestone" for the diversification of the EU's energy supplies. EU Energy Commissioner noted the importance of the ceremony for the development of the so-called Southern Gas Corridor (SGC), which he said could eventually meet up to 20 percent of the EU's gas requirements. (Winrow, 2014).

Around $28 billion in capital investment will be required to produce the gas and transport it to the Georgia-Turkey border. From there, additional pipeline systems will deliver 6 bcma of gas to Turkey and a further 10 bcma of gas to markets in Europe, in a route known as the Southern Gas Corridor. Shah Deniz gas will travel 3,500 kilometers, to elevations of over 2,500 meters, and over 800 meters below the sea.

The current concept for Shah Deniz Stage 2 includes:

- two new bridge-linked offshore platforms.
- 26 gas production wells which will be drilled with 2 semi-submersible rigs.
- 500 km of subsea pipelines will link the wells with the onshore terminal.

- upgrade of the offshore construction vessels
- expansion of the Sangachal terminal to accommodate the new gas processing and compression facilities.

In the first nine months of 2015, the Shah Deniz Stage 2 project continued to move ahead with a number of milestones achieved ahead of schedule. The Shah Deniz 2 project is now over 50% complete in terms of engineering, procurement and construction, and remains on target for first gas in 2018 (http://www.bp.com/en).

The Southern Gas Corridor

The shareholders of Shah Deniz Ore consider the Southern Gas Corridor the way to deliver production to the final consumers. This requires enhancement of some existing infrastructure and development of a chain of new pipelines.

- The existing South Caucasus Pipeline (SCP) will be expanded with a new parallel pipeline across Azerbaijan and Georgia;
- The Trans Anatolian Pipeline (TANAP) will transport Shah Deniz gas across Turkey;
- The Trans Adriatic Pipeline (TAP) will take gas through Greece and Albania into Italy (http://www.bp.com/en).

The Energy Community (previously named the Energy Community of South East Europe, then the European Energy Community) comprises, besides the EU: Albania, Bosnia and Herzegovina, Kosovo, Macedonia, Moldova, Montenegro, Serbia, and Ukraine. If we omit Ukraine, which is not a member of any possible construction of Southeast Europe, and add the EU members Bulgaria, Greece, and Romania, then we have a list of those countries in that region which are candidates for Azerbaijani gas transited by TANAP through Turkey (Cutler, 2014)

Figure 1. **South Coridor Project**

Source: http://www.bp.com/en.

Together, these projects are known as the Southern Gas Corridor. It is arguably the global oil and gas industry's most significant and ambitious undertaking yet. And it

is a complex challenge involving many different stakeholders – including seven governments and 11 companies.

The Southern Gas Corridor is set to change the energy map of an entire region – connecting gas supplies in the Caspian to markets in Europe for the very first time.

First gas is targeted for late 2018, with supplies to Georgia and Turkey; gas deliveries to Europe are expected just over a year after first gas is produced offshore Azerbaijan.

The Southern Gas Corridor pipeline system has been designed to be scalable to twice its initial capacity to accommodate potential additional gas supplies in the future .(http://www.bp.com/en)

Another proposal not formally included in the SGC is the Azerbaijan-Georgia-Romania Interconnector (AGRI) project, which would transit Azerbaijani natural gas to the Kulevi terminal on the Black Sea and then by tanker to Constanta, Romania. The gas could be transported either as liquefied (LNG) or as compressed natural gas.(Cutler, 2014)

A.G.R.I project

Azerbaijan-Georgia-Romania Interconnector (AGRI) is the project of a transportation system of natural gas from Azerbaijan to Central Europe. From the Azeri Sangachal terminal on the coast of Caspian Sea, the gas has to be pumped by pipeline to the Georgian port of Kulevi up on the Black Sea, where it is planned to construct a liquefaction plant. From here, the liquefied natural gas (LNG) will be loaded and transported in special tank vessels in the port of Constanta, where it will be re-gasified and introduced in the Romanian pipeline system.

Figure 2. **Project Azerbaijan-Georgia-Romania Interconnector (AGRI)**

Source: http://www.agrilng.com/ro.

After completion of the Arad-Szeged pipeline the pumping of gas from Romania to Hungary will be possible and a significant gas volume, transported via A.G.R.I, will reach the Central European market. In the opinion of the initiators, the A.G.R.I project has the potential to become an important tool for ensuring energy security of the European Union, which shall correspond to the double diversification goal - both supply sources and transit routes. A.G.R.I is the first LNG project to be developed over the Black Sea, which aims to transport gas from the Caspian region to Europe.

The project, in statements, provides for countries in the region, the opportunity of a secure supply and the diversity of imports to reduce dependence on a single supplier, both through diversification of supply and delivery channels. Southern Gas Corridor, designed as a direct link between Europe and the largest natural gas deposit in the world, plays a central role in achieving the objectives of the European strategy to ensure competitiveness and security of gas supply. Interconnector Azerbaijan-Georgia-Romania-Hungary (AGRI) was designed as an integral part of the Southern Corridor, providing the shortest direct route for Caspian gas to the European market.

Short history of A.G.R.I project

On 13 April 2010, in Bucharest, a "Memorandum of Understanding on cooperation in the LNG and its transportation" was signed between the Ministry of Economy, Trade and Business Environment of Romania, the Ministry of Industry and Energy of Azerbaijan and the Ministry of Energy of Georgia.

On 12 May 2010, the ministries of the three countries signed in Tbilisi, the "Protocol on the AGRI project development Company," which established the principles that will underpin its establishment and operation.

The AGRI Summit in Baku, held on 14 September 2010 agreed to invite Hungary as a country project partner, due to its approaches supported by the Romanian. At the end of the Summit the "Baku Declaration" - a document that sends an important political signal of support from the highest level of first project LNG at the Black Sea - was signed by the presidents of Azerbaijan, Georgia and Romania and the Prime Minister of the Republic of Hungary, . Within the same summit, at the level of the 3 national companies, the Article of Association of the AGRI project and a Memorandum of Understanding (MoU) which will shape the structure and principles of implementation of the AGRI project and its development was signed. Based on these documents, on 24 January 2011 SC AGRI LNG PROJECT COMPANY SA, having as shareholders ROMGAZ (Romania), SOCAR (Azerbaijan) and GOGC (Georgia), later being appointed the Hungarian company MVM were recorded.

On December 5, 2011 an international auction was launched which was completed in April 2012 and in 28 June 2012 the "Contract for Consulting Services" by the British group of engineering in oil and gas Penspen Limited for Feasibility Study, was signed. It was presented on 3 to 4 December, 2014 in Bucharest, the results of which were discussed on 24 June 2015, in the Inter-ministerial Meeting regarding the AGRI project.

The conclusions of the feasibility study showed that two of the scenarios analyzed were feasible: 5 billion cubic meters / year or 8 billion cubic meters / year. At the same time efforts were made to promote this project at EU level actions that have resulted in its inclusion in the list of Projects of Common Interest. (http://www.agrilng.com/ro)

Table 1. *Estimated costs of the project, due to capacity of transport*

Project capacity	Estimated Costs
2 billion cubic meters	1.2 billion euros
5 billion cubic meters	2 billion euros
8 billion cubic meters	4.5 billion euros

Source: http://www.agrilng.com/ro.

The estimated costs for AGRI will be exceeded given that none of the participating States have the knowhow in LNG technologies. Necessary pipeline infrastructure modernization and costs of a fleet of LNG tankers can also lead to massive budget overruns. Money still has not been found and it is difficult to finance the project AGRI because of the cyclical oversupply of natural gas in the European market due to the massive success of technologies for extracting shale gas in the US and to the LNG excess on international markets (Vasilescu, 2013).

So one of the greatest uncertainties related to the reliability of the AGRI project is given by the possibility to dismiss the gas production required for its operation.

Geopolitical realities in A.G.R.I. Project

Azerbaijan can also be put in the position to give up in front of the geopolitical pressures that this country can receive, either from Turkey or the Russian Federation, motivated by preserving monopoly on energy routes in the region.

Although Turkish Stream is suspended after the military incidents at the Turkish - Syrian border, Azerbaijan finds itself in the situation to be avoided by that Gazprom project that was proposed and agreed by presidents of Turkey and Russian Federation (http://www.curierulnational.ro2015-07-06).

The main opportunities for continuing the project by the Azerbaijani side is limited to the option of diversifying natural gas export routes (avoiding both Russia and Turkey) to Europe and to the opportunity to enter directly the market from countries in South East Europe.

Azerbaijan and Bulgaria have also signed an agreement on creating a system similar to the AGRI gas transport on the Black Sea, but using compression natural gas technology (CNG). Ukraine, on the other hand, has expressed its interest to import Caspian gas in liquefied form. The commercial prospects of AGRI project type would be considerably improved if all these potential customers would agree on a single shipping gas technology - or LNG or CNG.

Although CNG technology is still experimental, its cost is lower than LNG and would give a realistic chance of a trans-Caspian solution based on CNG, which would connect the Turkmen natural gas at Azerbaijan terminal. Otherwise, the opposition of Russia and Iran in building the trans-Caspian pipeline will not weaken, given that the two regional powers raises a veto right in the legal disputed context of Caspian Sea.

Georgia, a country of transit gas from the Caspian region to Europe, had an armed conflict with Russia. It still feels threatened by Russia, which expanded the border with Georgia in a forced way. The Tblisi government accuses Moscow for violating its sovereignty by moving frontier marks a kilometer into Georgian territory.

Russian troops positioned the marks at the border that separates Georgia from the pro-Russian breakaway region of South Ossetia, an area crossed by a section of the Baku Oil pipes. (http://www.curierulnational.ro/2015-07-16)

By simply consulting a map of the area, it is clear that the territory controlled by Russia is a very short distance from the gas path of the AGRI project, whose safety cannot be assured by Georgia.

Besides the economic benefits related to transit gas from the Caucasus the involvement of NATO and EU member countries in the project, assures, in the Georgian vision, a security guarantee, plus the efforts of this state to join Euro-Atlantic structures.

Romania hopes that, in light of good historical relations with Azerbaijan, to persuade this country to pursue the project (latest big project in which Romania is a

part), considered by the Romanian part one of its policy priorities undertaken by regional leader in the wide area of Black Sea.

From a historical point of view, Romanian-Azerbaijani relations can be summarized through the following milestones:

- Romania was the second country after Turkey, which recognized the independence of Azerbaijan on 11 December 1991. Diplomatic relations between the two countries were established on 19 June 1992 and the Romanian embassy in Baku was opened on 3 November 1998.
- During the official visit of President of Azerbaijan in Romania in September 2009 the Declaration establishing the strategic partnership between Romania and Azerbaijan was signed.
- Romania took over from 1 January 2009, the mandate of NATO Contact Point Embassy in Baku for 2009-2010 **(** http://azembassy.ro **)**

Another political project which bring together Romania and Azerbaijan is related to the European Neighbourhood Policy (ENP) of EU and involves, along with EU Member States, six countries in its Eastern neighborhood: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. It was launched during the EaP summit in Prague on 7 May 2009.

Also known as the Eastern Partnership (EaP), the concept aimed at expanding the area of prosperity and security in the EU Eastern Neighborhood, based on a common set of values and a gradual harmonization of policies.

The main objectives of the Eastern Partnership aims at projecting a climate of security in the region, democratic stability and economic and social progress, with a stronger political association and economic integration and also ease approaching of partner states by the EU values and rules in line with their aspirations and individual capacity.

EaP has two dimensions- which?. The bilateral involves agreement and concluding Association Agreements / AA, including some Deep and Comprehensive Free Trade Agreements / DCFTA and also, as long-term target, the possibility of a visa free travel regime. Cooperation at the multilateral dimension is carried on under four thematic platforms "Democracy, good governance and stability", "Economic integration and convergence with EU policies", "Energy security" and "Contacts between people" and is based also on some panels work and pilot programs. They allow partners to be engaged multilaterally, this dimension being a vector of facilitating the exchange of information and experience in the processes of transition, reform and modernization.

EaP central pillar refers to the process of economic integration and to the fact that economic reform is sustainable only accompanied by political reform and civil society development. (Http://www.mae.ro)

The main obstacles in developing the project from the perspective of Romania relates to the fact that AGRI is a project of regional scale and relatively low capacity (create a market of liquefied gas exclusively to the Black Sea). The prospect of using regasification terminal in Constanta for importing LNG from large producers of the world is almost excluded by the reluctance of Turkey (already hostile to AGRI project) to allow traffic supplementation through the Bosfor with transoceanic LNG tanks.

Another aspect for which AGRI has a relatively modest view in the architecture of the energy projects undertaken at EU level is linked to low capacity (up to 5 billion cubic meters per year) to ensure the large capacity interconnection of Member

Southeast Europe (in terms of cyclical oversupply of gas to the European market makes it difficult to finance costly projects), providing low energy security guarantees to the states which are vulnerable in this regard.

S.W.O.T. Analysis - AGRI project

One of the most accurate way to understand the status of a project, in a scientifically approach, is represented by an analysis of the present evolution. Further, we tried to obtain a realistic S.W.O.T. analysis of the AGRI Project, divided on each country involved, at least in the Strong Point section.

Strong points

Romania

- AGRI will allow Romania to stop the import of Russian gas and to provide its own necessary energy resources;
- AGRI is a way of diversification of gas imports;
- National territory would be crossed by significant amounts of gas destined for Central Europe, the transit fees providing a significant income;

Azerbaijan

- AGRI is an option of diversifying natural gas export routes to Europe (avoiding both Russia and Turkey);
- AGRI project represents an opportunity for a direct entry into the market of South-East European countries.

Georgia

- For Georgia, AGRI is an additional element to strengthen the architecture of the Southern Corridor;
- Will provide extra income from transit;
- At the political level, it will have the opportunity to demonstrate assuming values, and also the Western interests in the area

General Aspects

- The estimated time of implementation is relatively short: 3-4 years.
- AGRI is part of the Southern Corridor concept and thus may qualify for financial support from the EU.
- Transporting LNG is done through international waters and it is not affected by the transit restrictions imposed by other forms of land transport
- The project provides wide opportunities to successfully implement the EU Eastern Partnership program, boosting political and economic cooperation between Azerbaijan and European countries

Weaknesses

- The uncertainty of financial sources. The estimated costs can vary between two and five billion Euros;
- None of the participating States have the know-how in LNG technologies.
- AGRI is a project of regional scale and of relatively low capacity (it creates a market of liquefied gas exclusively limited to the Black Sea). The prospect of using the regasification terminal in Constanta for importing LNG from large producers of the

world is almost excluded by the reluctance of Turkey (already AGRI project hostile) to allow traffic supplementation with transoceanic LNG tanks through the Bosporus.

- AGRI has a low capacity (up to 5 billion cubic meters per year) to ensure a high capacity link of the South East European states, thus providing energy security low guarantees to the energy vulnerable states in the region.
- Compete with other projects of a greater scale.

Opportunities

- Azerbaijan and Bulgaria also signed an agreement on creating a system, similar to the AGRI, of gas transport on the Black Sea, but using a compression of natural gas technology (CNG). Ukraine, on the other hand, has expressed interest to import Caspian gas in liquefied form. The commercial prospects of a AGRI-type project would be considerably enhanced if all these potential customers would agree on a single technology of shipping the gas - or LNG or CNG.
- Although CNG technology is still experimental, its lower costs, as opposed to LNG, would give a realistic chance for a trans-Caspian solution based on CNG, which would connect Turkmen natural gas to the Azerbaijan terminal. Otherwise, Russia and Iran's opposition in building the Trans-Caspian pipeline will not weaken, given that the two regional powers raised a veto in the legal context of the disputed Caspian Sea.

Threats

- the conjuncture's oversupply of natural gas on the European market makes it difficult to finance some expensive energy projects, especially when they are perceived as major security risks. Like other Southern Corridor projects, AGRI depends on Georgian territory transit. Georgia, the Corridor's fragile link, which will sustain of the most sophisticated and costly part of the AGRI system: the liquefaction Plant of Kulevi port. Given Moscow's aversion on the key role of Georgia in the non-Russian transit of Caspian hydrocarbons, the probability of incidents or pressure is very high.
- by the actual low pressure issues of the Romanian gas grid it is not possible to export the gas from Romania to Hungary where the pressure is much higher.
- AGRI does not have an European strategic scale. The involvement of states and / or western energy corporations would provide security guarantees that, the littoral states of the Black Sea cannot bring on their own.
- AGRI excludes Turkey from the Azerbaijani gas transit to Europe, undermining its position as a regional energy hub. Therefore, Ankara is hostile to any energy plan that undermines this role.

The main conclusion of the analysis, in our opinion, is that every country involved in the project has great expectation in completion of it-???. Individually, each country has its own interest in the project, although we identified mostly political interests, rather than economical ones.

Conclusions

The knowledge in the evolution of the project and the analysis we tried to elaborate, allowed us to make an accurate map of the realities faced in ensuring energy security, at European level. As we presented in the previous chapter, all the states involved are

interested in completion of that regional LPG project. Still, the present situation of the gas market, is not encouraging in developing projects at this scale.

The ambitious goals of the AGRI project, assuming its completion, can be an alternative to the hegemony practiced by the Russian Federation to the European market gas. However the technical solutions proposed exceed the costs of a classical pipeline, although initial investments are much lower, plus the obvious uncertainty linked to the insurance of the amount of gas required for the ongoing of the process.

Another reason why Romania is interested in the continuation and development of the project can be identified in terms of transport to Western Europe of gas quantities that are expected to be operated in Romanian territorial waters. Estimates amounts are raised to a production of 50 billion cubic meters per year, which may be exploited in about 3-4 years. In terms of domestic consumption of 10 billion cubic meters per year, Romania could become a net exporter of natural gas and for this purpose the infrastructure in the national territory can be used and developed by the AGRI project.

Trying to make a medium time projection of the A.G.R.I. Project, we start our analysis from the oil price, one of the lowest in history. Due to the fact that Iran has the permission to export oil and Saudi Arabia increased the production, we estimate that the price will stay at this level for a period of at least 2-3 years. The price for natural gas is directly proportional with crude oil one, so, it will also stay low. Combined with a demand which is the lowest in the last decade, the price will remain at that level for a few years. In that condition, the massive investment in the A.G.R.I. project is not reliable from an economical point of view.

The sum of investment costs, the technological costs for liquefaction, special transport and degasification, pumping at high pressure in the on-shore pipelines of Romania in order to make this gas available for the EU market will be very high, by consequence not competitive and the commodity will be out of the market. At least by the actual unprecedented low prices for fossil fuels/hydrocarbons on the international markets, such a project has no chance to be evaluated as realistic.

However, we believe that the economic sustainability of the project is exceeded by the geopolitical and geostrategic interests of the states involved in it, the future being the only one which can reveal how the project will result, although we believe that the A.G.R.I. Project will be „frozen".

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Efficiency in solar power plant

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Abstract. *In the last years, some proposals have emerged for the construction of "eco-cities" which often incorporate technologically and very sophisticated building design, sumptuous master-planning with renewable energy sources, and efforts to achieve resource self-sufficiency. This trend is subject to intense criticism among some proponents of sustainable urbanism, on grounds ranging from the purported social exclusivity of eco-cities to the claimed incompatibility between a sustainable mode of living and continued economic growth in the contemporary Western model. Masdar city is the first city in the world built on the renewable energy, with zero carbon, zero waste, and zero car cities (Thorpe, 2009). A pioneer city of renewable energy and an eco-city still under-construction in the United Arab Emirates, Masdar City serves as a useful case study in this project, with unconventional features such as the aim of developing a zero-carbon electricity supply or the underground network tunnels. After examining the Masdar project in particular, we will offer a method for evaluating the environmental and social effects of eco-cities. Using the dual concepts of an "experimental" approach that favors a diverse collection of initiatives for ecologically conscious urban planning and a "human-benefits" perspective that emphasizes inhabitants' quality of life, the paper concludes that, despite its disadvantages, Masdar City represents an important advance in the field of sustainable urban design (Hamilton, 2000).*

Keywords: eco-city, Masdar, the Source, clean transportation, smart transportation, Middle East, Islamic, urban design.

Introduction

The United Arab Emirates has one foot firmly planted in tradition and the other stretching toward new ground (Anderson, 2013). The UAE was built on traditional fossil fuels – an OPEC member since 1967, home to the world's 7th largest oil and natural gas reserves and the first Middle Eastern country to export LNG – the country is also a regional and global renewable energy pioneer. The UAE recently inaugurated the largest thermal solar power plant in the world – Shams1- and the Arabian Islamic nation is about to begin producing nuclear power, a significant accomplishment given to the region's geopolitical complexity. Against that backdrop, the UAE has embarked on an aggressive experiment into urban sustainability designed to rely upon and pioneer cutting edge renewable energy technology with a project called Masdar City.

Masdar City is a 6km2 master-planned eco-city located approximately 22 miles southeast of central Abu Dhabi in the United Arab Emirates (UAE) (Henrie, 2015). Designed by the British architectural firm Foster + Partners in 2006, the project was originally set to be completed just 10 years later. However, during the global financial crisis, this completion date was pushed back to 2025. Masdar City is planned as one of the world's first completely sustainable communities, which combines renewable energy sources and efficient resource usage with traditional Arabian design. In order to achieve the city's goal of being one of the most sustainable cities in the world – as well as a great place to live and work – every aspect of the city's urban planning and architecture has been approached with sustainability in mind. More specifically, design should seek to facilitate energy generation and reduced consumption of electricity and water.

Following a review of Masdar City's master plan, especially its environmental and social implications with the current scholarship on sustainable urban design, this paper presents an analysis for eco-city development, on one hand, and a specific assessment of the benefits and disadvantages of the Masdar project on the other hand. Substantial progress in lessening the global ecological impact of cities requires widespread public support, and therefore depends on whether sustainable communities will also offer clear benefits for their residents' quality of life. Although it may perpetuate certain less desirable social effects, Masdar City could serve as the first clear public demonstration that environmental protection can be firmly and tangibly integrated with the development of a more attractive and livable urban community.

Literature review

Beginning in the early 2000s, the number of urban sustainability experiments across the world began to grow exponentially. This is due in part to the efforts of international development agencies like the World Bank, which launched its Eco2 Cities program in 2010 to inspire new rounds of sustainable development in Eco-cities", Smart Cities, Techno Cities, Eco Islands and Eco Villages (Henrie, 2015). It seems that eco-city development is a distinctly global phenomenon: Europe and Asia have 73 and 70 eco-city projects, USA show 25 eco-cities, while Africa and the Middle East show only 10. While most of these projects are expansions of existing urban centres, an increasing number of Greenfield, or new-build, developments have been identified in countries as diverse as China, Korea, the United Arab Emirates, Nigeria, Malaysia, Kenya, Ghana, Spain, Taiwan and Portugal. These new-build eco-cities are often multibillion dollar megaprojects, commissioned and developed by international coalitions of architects,

planners and politicians. Funding for these megaprojects typically comes from a mix of public and private sources, though there are exceptions.

Table 1 offers a more complete, though by no means exhaustive list of new-build eco-city developments:

Table 1: *List of master planned new-build eco-city*

Name of Project	Country	Name of Project	Country
Zira Island	Azerbaijan	Amanora Park Town (Pune)	India
Black Sea Gardens	Bulgaria	Fujisawa Sustainable Smart Town	Japan
Changxing Ecological City	China	Konza Techno City	Kenya
Chongming Eco-Island	China	Tatu City (Nairobi)	Kenya
Dongton	China	KL Eco-City	Malaysia
Guangming (Shenzhen)	China	Eko Atlantic City (Lagos)	Nigeria
Hongqiao Low Carbon Business Community (Shanghai)	China	Blue City	Oman
Langfang Eco-Smart City	China	Rawabi	Palestine
Meixi Lake (Changsha)	China	Mata de Sesimbra	Portugal
Nanjing Eco High-Tech Island	China	PlanIT Valley	Portugal
Western Ecological City (Suzhou)	China	Urjuan	Qatar
Tangshan Caofeidian	China	Energy City	Qatar
Tianjin Eco-City	China	Eco-City 2020 (Mirny)	Russia
Wanzhuang Eco-City	China	King Abdullah City for Atomic and Renewable Energy (KACARE)	Saudi Arabia
Xinjin Water City	China	Punggol	Singapore
Neapolis Smart EcoCity (Paphos)	Cyprus	Gwanggyo Ekonhill	South Korea
Home Office People Environment (HOPE) City	Ghana	Incheon Eco-city	South Korea
Changodar Eco-City	India	Sejong	South Korea
Dahej Eco-City	India	Eco-City Montecorvo	Spain
Manesar Bawal Eco-City	India	Masdar City(Abu Dhabi)	UAE
Shendra Eco-City	India	Ziggurat(Dubai)	UAE
Godrej Garden City	India	Xertitown (Dubai)	UAE
Gujarat International Finance Tec-City (Ahmedabad)	India	Sseesamirembe Eco-City	Uganda
Mahindra World City (Jaipur)	India	Destiny, Florida	USA
		Treasure Island (San Francisco)	USA

Source: Masdar City and the politics of utopian eco-development in the United Arab Emirates.

Masdar City is named for the government-owned renewable energy company – Masdar, meaning "the source" in Arabic (Anderson, 2013). Today, Masdar is comprised of four business units-namely Masdar Capital, Masdar Clean Energy, Masdar Special Projects and Masdar City (Ouroussoff , 2010). It is complemented by Masdar Institute, an independent, research-driven graduate university. Masdar is a fully-owned subsidiary of the Mubadala Development Company, an entity owned by the Abu Dhabi government. Masdar sits under the newly Mubadala Energy Division and it represents Abu Dhabi's answer to the growing environmental and energy concerns of this century.

Masdar City is seen as a project between an expensive gamble bankrolled by oil wealth and a visionary approach to sustainable urban development that could help turn down the climate change dial.

Lessons learned along with technology solutions developed as part of this unique project could be applied in other parts of the developing and developed world to assist governments seeking to reach greenhouse gas reduction targets (Roselund, 2015). The most striking feature of Masdar is the city's ever-present focus on efficiency and optimization, added by a minutely detailed master plan that specifies everything from the type of electricity meters to the facades for the buildings.

For a community that aims to accommodate 40,000 residents, 50,000 commuters, and more than 1,500 businesses, the city plan represents an immense and ambitious undertaking (Peter, 2002). All buildings at Masdar, designed to maximize the use of natural light, fulfill strict regulations concerning the use of insulation, low-energy lighting, and energy-efficient appliances. They need also only a quarter of the energy supply required by a normal city with the same population. Water consumption will be reduced by installing high-efficiency fixtures and appliances and incorporating an advanced network of meters that not only notifies consumers of their usage levels but also determines the location of water leaks throughout the city. In addition, the city's landscaping, which includes plants selected for their low water requirements, will be irrigated with treated wastewater, allowing Masdar's total water demand to be less than half that of a regular community (Wagle, 2014).

Table 2: *High Performance KPI*

No	KPI (Key Performance Indicators)	Target
1	Energy Consumption	40% Reduction
2	Interior Water Use	40% Reduction
3	Exterior Water Use	No Potable Water to be used
4	Operational Waste	50% diversion from landfill
5	Construction Waste	70% diversion from landfill
6	Embodied Carbon in materials	15% reduction in overall
7	Construction Waste	70% diversion from landfill
8	Sustainability Rating System	3 Pearl minimum

Source: Global Sustainable Cities Network, Masdar – Building a Sustainable City.

Figure1. **Artistic rendition of Masdar City***.*

Source: Foster and Partners.

Despite the fact that few buildings have been completed, Masdar's developers state that the city is already operating the largest solar photovoltaic plant in the Middle East (Cusick, 2015). Masdar has a 10 megawatt PV solar field installed in June 2009 – still the largest in the Middle East – that currently supplies more energy than required, allowing the excess to be fed into Abu Dhabi's public power grid. It is constructed on a land Area of 210,000 m2 with 10MW installed capacity. It displaces approx. 15,000 tons of CO2 annually and 87,780 modules. Solar powers will be the primary energy source for the construction process itself and eventually for the completed city, to utilize the abundant sunlight in Abu Dhabi's desert climate. Photovoltaic panels will be strategically placed on building roofs, canopies, and other available open spaces, often conveniently providing shade from the intense desert sun while simultaneously providing the city with energy (Lisell, 2009). One of the primary advantages to building a solar-powered city in such a climate is the ability to test and experiment with the latest solar power technologies. Currently, forty-one different photovoltaic panels from thirty-one different manufacturers are being incorporated into the design for testing.

Figure 2: **Solar panels on rooftops and canopies**
Source : http://www.skyscrapercity.com/showthread.php?t=897392.

Furthermore, a planned geothermal energy project will pump water into the earth's crust to produce steam for electricity generation. Some of the city's waste will be recycled, while some will be incinerated in an electricity-generating process that releases significantly less carbon dioxide than a landfill does. Roughly 80% of the city's water will come from greywater recycling systems (Malyak, 2009). With few sources of fresh water nearby, the city's water supply will be provided by a desalination facility that uses electricity from a massive hydrogen plant. This hydrogen plant is planned as the world's largest, and is expected to cost $2.2 billion.

Given the sheer size and diversity of its projects, Masdar serves as a showcase for unconventional planning methods and renewable energy technologies that other communities might find difficult to implement without Abu Dhabi's wealth. At the same time, the intense concentration on efficiency and renewable resources encapsulates Masdars logical appeal: the notion that sustainable urbanism will become a broadly accepted and feasible goal only after someone demonstrates that a city with almost zero carbon emissions is possible on a large scale.

In addition to these local projects, Masdar Corporate has also become increasingly involved in a number of high-profile renewable energy initiatives at the national and international level. The Shams 1 concentrated solar power (CSP) plant is a 2.5 km2 array, located in Madinat Zayed. Masdar Corporate also has a 20% share in the London Array, a 1000MW offshore wind farm being developed off the coast of England. When completed, this plant will generate enough energy to power approximately 750,000 homes, or a quarter of the greater London Area (Henrie, 2015). Masdar has also just announced its 35% stake in the Dudgeon Offshore Wind Farm, a 402MW project off the coast of North Norfolk. Another important joint venture is the Torresol Energy project in Spain. This series of three CSP plants will have a total capacity of 120MW when completed. Masdar has also instituted a special projects unit, tasked with implementing renewable energy projects in "challenging contexts," such as Afghanistan, Seychelles, Samoa, Oman and Tonga.

Architectural features in Masdar City

In its architectural features, Masdar's developers show the same dedication to innovative urban planning, capitalizing on the environmental advantages of traditional Arabian architecture but not hesitating to employ expensive technological solutions. Centuries before the modern era, the people of the region designed their settlements to moderate the desert heat, building on high ground to obtain both defensive benefits and stronger winds and constructing tall wind towers to channel air currents onto the streets. Such techniques inspired Foster & Partners to elevate Masdar above the surrounding area, employ wind towers of their own, and incorporate narrow streets oriented at an angle that maximizes shade at the ground level. At the center of the developers 'vision for the city lies the Masdar Institute, a graduate university affiliated with the Massachusetts Institute of Technology that opened in 2010 and focuses on research and engineering in sustainable technology . To satisfy Middle Eastern norms for personal privacy, the residential buildings of the campus are enclosed in a wavy facade of concrete latticework, displayed in Figure 3, similar to the traditional screens known as mashrabiya(Foster, 2010).

Figure 3. **Student housing in Masdar City**
Source: Foster and Partners.

While the latticework shields the interior from direct sunlight, the curves provide an angled view that prevents the inhabitants from seeing into the windows of buildings across the street. In accordance with local custom, the campus is also

segregated by gender, placing the living quarters for single men on one side and those for women and families on the other. These aspects of the city's design contrast sharply with the distinctively modern style of the main buildings in the Institute, including the Knowledge Center, which houses study spaces under an iconic spherical roof covered with solar panels and zinc cladding (Figure 4).

Figure 4. **A view of the Knowledge Center at the Masdar Institute**
Source: Foster and Partners.

Masdar's master plan expresses a sense of order and authority, founded in its developers' confidence that they can remake the whole structure of urban life through technological improvements, careful design, and active civic management. This observation is well illustrated by the "Personal Rapid Transit" system of automated electric cars, envisioned as a more efficient and attractive version of a public transportation network. By eliminating not only gasoline usage but also the entire concept of the private automobile, the city's architects are transforming social standards and creating a new pedestrian community, easing the transition by offering almost exactly the same degree of comfort and convenience. The master plan outlines three primary means of transportation: walking, a light rail system, and an elevated personal rapid transit (PRT) system (Figure 5). This integrated system intends to provide a public transit stop within two-hundred meters of any given point in the city (Foster, 2010).

From its developers' standpoint, Masdar City strengthens its emotional resonance with the promise of environmental protection and social revitalization that rise organically from the established local culture, essentially fusing modernity and tradition. In its larger structure, depicted in the artist's impression shown in Figure 3, the city exudes an aura of geometrical design, with the buildings arranged in neat squares, areas of solar panels and processing facilities placed around the outskirts, and parks occupying the remaining spaces.

Of course, the city's architects could have the freedom to realize this ideal only in a sparsely populated desert region with extensive government funding. In parallel with its promotion of sustainability, Masdar also furnishes a classic example of a development motivated by the financial potential of new technologies used to combat emerging social concerns (Green, 2010).

Figure 5. **Elevated tracks for the personal rapid transit system**
Source: http://www.treehugger.com/files/2008/01/ecocities_every.php.

Economic strategies and implications

Over the next twenty years, the emirate of Abu Dhabi intends to use the Masdar project to encourage private entrepreneurship, facilitate scientific research in renewable energy, and generate economic growth in areas other than the oil industry. As a special economic zone within Abu Dhabi, Free Economic Zone, the city offers a zero-percent tax rate on income and imports, and permits the establishment of businesses that are wholly foreign-owned (Masdar City, 2013). Significantly, this FEZ status means that Masdar City will be one of the few places in Abu Dhabi where corporations can bypass local laws mandating 51% Emirati ownership, as well as where non-citizens can own property.

The expansion of Masdar City is contingent upon ever-expanding partnerships with clean tech businesses. Current business partnerships include: General Electric, Mitsubishi, Bayer Material Science, Abengoa Solar, Vestas Wind, Schneider Electric and Armalia Parters(Figure 5). GE, for example, has sponsored an "Ecomagination Center" at the Masdar Institute, which aims to find innovative solutions that help solve environmental challenges while driving economic growth (David, 2005).

The developers argue that sustainable building practices will be adopted on a sufficiently broad scale to combat climate change only if environmentally conscious urban planning proves economically appealing. Consequently, the meticulous master-planning approach that Masdar exemplifies might impose a level of social change that would be unacceptable for many people, and at the same time conform excessively to the conventional economic norms underlying Abu Dhabi's carbon-intensive culture (Rosser, 2011). Currently, the United Arab Emirates possesses the world's highest per capita ecological footprint, a measure of the biological capacity required to fulfill resource demands and absorb waste emissions. Indeed, the fundamental question of the extent to which sustainability requires profound societal and economic change applies not only to Masdar, but also to every other proposal in the literature on sustainable development.

Despite the irony in the idea that wealth from the oil industry is now funding the development of this carbon-neutral eco-city, projects of this immense scale obviously

require hefty investments that only organizations with large surpluses could fund. For such projects to be successful, stakeholders must possess the "willingness to invest in the seed capital" to initiate the development process. From an economic perspective, it is beneficial to the world economy for Abu Dhabi to front this initial "seed" investment for an eco-city that can serve as testing grounds for renewable energy technologies in the experimental stages, as well as a research institute that theoretically will produce information that will benefit society as a whole.

Masdar's $22 billion budget serves as an incentive for additional innovation, which can also be considered a benefit to the economy (Malyak, 2009). When large sums of money are allocated to a given cause, there is an incentive to be a part of that cause. For example, the city plans originally did not include aluminum as a primary building product because of the high carbon emissions associated with its production processes. However, aluminum companies responded by developing a more competitive product with significantly reduced carbon emissions to prevent their product from being excluded from the project. This example illustrates that market-driven incentives can spark innovation, which increases competition and variety in the economy. At the most basic level, the concept of Masdar as an eco-city itself was born out of an incentive-driven innovation.

In a simpler and more obvious sense than both seed capital and incentive-driven innovation, the development of a master-planned eco-city like Masdar has job-creating potential that is especially attractive during an economic recession (Malyak, 2009). The Masdar project will create a wide array of jobs associated with the planning of an eco-city, including the design and planning phases, the construction process, the businesses that will eventually inhabit the city, and the faculty and staff working at MIST.

Figure 6. **Siemens ME HQ – The most Sustainable Commercial building in Abu Dhabi**

Source: Foster and Partners.

Masdar, like many similar eco-city projects, is also explicitly designed to be a "green print"—a model for sustainable development that can be duplicated across the globe. This, combined with the aforementioned corporate interest in eco-cities, has prompted Hodson and Marvin to argue that the objective of these projects "is to turn the

whole development process, including the energy and infrastructure, into a single financial product that is replicable in other contexts". This would seem to suggest the financialization of sustainable urban development— such that it is not an eco-city's value as a physical resource that is of importance, but rather its ability to be bought and sold on the market as an abstract commodity (Hodson, 2010).

Critical analysis

Although Masdar has much to offer as an eco-city that can serve as testing grounds for experimental technologies and as an example for other cities to lessen urban environmental impacts, the development of an entirely new city provokes criticism and raises irony. First, Masdar, as an eco-city, does not contribute to increasing the sustainability of the United Arab Emirates as a whole, considering that the U.A.E. is one of the most unsustainable and largest carbon-emitting areas in the world. Masdar's claims of producing zero carbon emissions even within the city itself are misleading (Saleh, 2013). Until energy storage technologies for solar power are developed, the city will have to export its excess energy to the city of Abu Dhabi during the day, while using energy from the city's grid at night when sunlight is not available.

Furthermore, the walled-in, six-square kilometer city intentionally did not allow energy-intensive industries inside in order to keep its energy consumption lower. The practice of selecting the types of businesses to allow in the city plan raises the larger issue of determining the actual scope of sustainable city development; the environmental impact of the city is highly dependent on where its boundaries lie. For example, when considering Masdar's carbon-neutrality, does one include the countless flights from Europe to the U.A.E (Malyak, 2009). required by the design team in the planning stages of the project? Such an example demonstrates how in the case of any eco-city, it is possible to frame a project favorably by purposefully excluding factors such as international flights or by careful drawing city limits to exclude harmful factors.

Especially in an area like Abu Dhabi, skeptics fear that Masdar may be a case of greenwashing on an urban planning level. As Professor Peter Droege, chair of the World Council for Renewable Energy believes, Masdar could be viewed as "an oil producer buying a bit of insurance" The spectacle of developing a zero-emissions city may, in fact, be an attempt to transition to renewable technologies before their oil supply runs out. However, despite the possibility of Masdar being a large case of greenwashing, Register believes there is the possibility that Masdar will have a beneficial impact. "If Masdar stands alone as an isolated green jewel while the rest of the UAE proceeds along its current Bigfoot path, you could call it greenwashing. If instead it serves as an active laboratory that inspires the UAE and other regions…then it could make a real contribution". If nothing else, at least the wealth generated by the oil industry, in this case, is being put towards the cause of developing renewable energy technologies.

Many different models of sustainable urbanism have been devised, as Yosef Rafeq Jabareen, an urban studies lecturer at the Massachusetts Institute of Technology, explains in his article, "Sustainable Urban Forms: Their Typologies, Models, and Concepts. "Neo-traditional development," also known as the "new urbanism," seeks a more vibrant sense of community and more architecturally appealing development patterns, concentrating on mixed land use, walkable public spaces, diverse housing types, and somewhat higher population densities (Jabareen, 2006). In another approach, "urban containment" efforts intend to lessen suburban sprawl by employing greenbelts, mass transit, and various regulatory policies. In comparison with urban

containment, other initiatives support a far higher level of building density and mixed land use, dramatically minimizing the demand for automobile travel. Lastly, proposals for the "eco-city "emphasize urban greening and "passive solar design," which involves the efficient use of sunlight and absorbed heat in buildings, with a notable focus on the active management of social and economic life in the community.

It is noted that about three-fourths of current eco-city projects rely primarily on technological innovation rather than a more holistic platform, including social and cultural aspects such as social justice and local democracy. Some authors criticize recent eco-city proposals as socially regressive (Mike Hodson, Simon Marvin). They argue that cities must now guarantee their "ecological security "by safeguarding resources such as water, energy, and food supplies amid the uncertainties of climate change and a globalized economy. Hodson and Marvin describe the emerging pattern of "integrated eco-urbanism, "in which new developments "build ecological security by internally producing their own food, energy and other critical resources, reusing wastes as resources and reducing reliance on external infrastructures.

This approach, typified by Masdar City, emphasizes technological solutions, especially renewable energy sources, to overcome resource constraints in independent, self-sufficient enclaves. From their perspective, eco-cities are offering ecological security as a "mobile financial product" that only the wealthy can afford, while excluding other social groups and failing to introduce any truly substantial behavioral or economic changes (Hodson, 2009).

In other words, the current concepts of an "eco-city or an "ecological city" embody values and methods which prioritize technocratic, managerial, and commercial strategies to combat environmental problems. Eco-cities presuppose certain societal and governmental structures, particularly a democratic political system and an established civil society, when the formation of these structures itself presents a central challenge for communities in the developing countries. But efforts to implement sustainable urbanism in the developing countries through the new technological methods usually result in exclusive "ecological islets" surrounded by poor and environmentally degraded neighborhoods. It is recommend a concentration on effective governance and civil society, as well as social justice and equity, while the pursuit of merely environmental sustainability as a goal in itself could worsen unjust social conditions.

In some ways, the diversity of perspectives on urban sustainability seems to arise from fundamental disagreements about sustainable development as a concept, particularly about whether planners should attempt to ameliorate specific environmental problems, or strive for a more comprehensive transformation of human society. The environmental protection can be reconciled with economic growth in a capitalist system, while poverty is commonly viewed as a cause of environmental degradation; both poverty and damage to the environment are actually produced by wealth. To achieve the objectives of sustainability, "we must . . . shift our economic development emphasis from the traditional concern with increasing growth to reducing social dependence on economic growth." (Roseland, 1992). On the other hand, the economic success of the developed world is based on the availability of inexpensive fossil fuels. An ecologically conscious form of society is directly opposed to one that promotes consumerism, convenience, and profit, calling instead for people to adopt more "synergistic," collaborative lifestyles.

Other authors believe that modern society and economic prosperity are indeed compatible with vigorous efforts to protect and preserve the environment. They bring proves which could undermine Roseland's premise that environmental damage results from wealth.

Although environmental decay increases with the growth in average income when the latter remains low, it decreases with income growth once the average annual income has exceeded a threshold of approximately $8,000 per capita (Stefano Zamagni of the University of Bologna). Ecological degradation harms economic development, and that the protection of the environment can promote economic growth. (Peter, 2011). It is recommended caution in instituting drastic social changes for environmental aims and the proposals to shift communities to the model of the compact city, with higher densities and greater provision of public transportation, would demand draconian regulatory regimes but yield, at maximum, about a 30% decrease in automobile energy consumption.

Significantly, all of these endeavors indicate strong ties between environmental protection and scientific progress. In its mission statement, the Siemens Centre of Excellence in Masdar displays a striking example of this modernist faith in better living through science in technology, saying it seeks to "drive quantum leaps in achieve carbon neutrality" through research and development. Likewise, Masdar Institute is a graduate university dedicated wholly to sustainable engineering and clean technology. While the city does mandate some minor changes in daily norms and behaviors (e.g., air conditioners are set to 77 degrees rather than Abu Dhabi's usual 60), the city's sustainability strategy centers on engineering our way out of the climate crisis. In this way, it functions as a purely spatial utopia, rather than a utopia of social process.

In fact, Masdar's developers seem quite opposed to demanding social and behavioral changes. They are adamant that, "environmental responsibility need not be a hardship" and have committed to ensuring that environmental protections do not mean "constrained lifestyles". These claims strike at the core of ecological modernization discourses, which promise that human societies can substantially reduce their carbon footprints, and comfortably maintain their consumptive, high-technology lifestyles. Although developers espouse a commitment to a triple bottom line model of sustainability, Masdar's attention to the social is limited to providing this "high quality of life" for its residents.

This is indicative of Gunder's argument that in triple bottom line sustainability, "the social, at best, is addressed with intangible platitudes". In addition to the eye-catching architecture and walkable, mixed-use spaces, Masdar's high-quality lifestyle is achieved by "maximiz[ing] convenience," so that residents can "find everything they need close at hand." Some examples of these "needs" can be found in the numerous food and retail shops occupying Masdar's lower floors, as well as the "extensive leisure and entertainment facilities," such as Ferrari World, Yas Waterpark and Yas Mall, available in Abu Dhabi at large. This high quality lifestyle is meant to be one of constant entertainment and conspicuous consumption— a hallmark of Harvey's "degenerate utopianism."

Cugurullo underscores the centrality of business and consumerism to Masdar's vision, saying that, and "attention toward the customer's needs is the key driver of Masdar's concept of 'social'. To their credit, the outreach team at Masdar has been working to increase the general public's presence in Masdar. They are working on

opening up roads into the development, and have implemented a Fridays at Masdar program—essentially a small, weekly festival catered to families and children. In spite of these efforts, it is unclear whether residents of Masdar City are finding the lifestyle it offers desirable.

One student described the eco-city as "prison-like," referencing the fact that Masdar's geographic isolation means that he lives, studies, works and socializes in a confined area with a limited number of people. While extreme, this statement suggests the potentially dystopian qualities of everyday life in an eco-city (Henrie, 2015).

Eco-cities around the world

Practical examples of the implications of these different theoretical approaches to sustainable development can be found by comparing Masdar City to some of the various envisioned, or actually constructed, eco-cities around the world.

In 2007 the Chinese government, in partnership with the British engineering firm Arup, was planning to establish the Dongtan eco-city on an island in the Yangtze River. In the city, designed to accommodate 500,000 inhabitants, electricity would be supplied by solar panels, wind turbines, and the burning of discarded rice husks, while gasoline-powered cars would be prohibited. Farms and parks would occupy most of the island's land area, and almost all waste generated by the city would be recycled through an automatic sorting system integrated into the streets. Nevertheless, by 2010, when the first phase was supposed to be finished, the completion of Dongtan was indefinitely postponed and most construction work was suspended. The reasons for the apparent abandonment of the project included uncertainty concerning whether it would be funded by Arup or the government, as well as the failure of the developers to engage the local community in the planning process.

Curitiba, a city in Brazil that is also classified as an eco-city, provides an illustration of a more successful attempt at environmentally beneficial urban planning, with an especially notable feature being its innovative bus system. Specially designed buses, operating on dedicated avenues and arriving at each stop once every 30 seconds during peak hours, transport 2.3 million people per day, more than two-thirds of the metropolitan region's total population. In the 1970s, Curitiba converted its downtown shopping district into a pedestrian zone, blocked the entry of polluting industries, and increased the land area devoted to parks and open spaces dramatically, from 5 square feet for each person to 540 square feet. Recently, nevertheless, the city's per capita car ownership has risen to the highest in Brazil, and its recycling rates have been decreasing, with some residents attributing these trends to low public participation in planning decisions and limited community willingness to adopt sustainable behaviors (Henrie, 2015).

Not coincidentally, Curitiba's environmentally progressive master plan was formulated when a military dictatorship ruled the country, in a remarkable parallel with the authoritarian Chinese government's support for Dongtan, and Masdar's dependence on the hereditary emirate of Abu Dhabi (Keenan, 2011). Comprehensively master-planned eco-city projects necessitate such large expenditures and strict regulations that only non-democratic governments might be capable of developing eco-cities on a large scale. For instance, political power in the United Arab Emirates remains mostly with the seven emirs. At the federal level, foreign affairs and defense are coordinated by the emirs, and political parties are banned; oil and natural gas reserves are controlled by the individual emirates, accounting for the striking wealth of Abu Dhabi, where almost

all the country's energy resources are located. Governmental decisions are strongly influenced by personal access to
the ruling family: for building, Masdar was developed by Lebanese engineers in contact with the crown prince of Abu Dhabi, who conveyed it to the emir.

Using income from oil exports, these regimes gain popular acquiescence to the lack of political rights by imposing low taxes, offering free medical care, and subsidizing energy supplies. As the examples of Curitiba and Dongtan show, however, even with strong initial support from the government, attempts at ecologically conscious development can falter when they are not grounded in widespread public acceptance of sustainability measures and strong community involvement in the planning process.

For example, Lurton Blassingame of the University of Washington at Oshkosh observes in a review of urban sustainability endeavors that residents must be willing to alter their ways of life, not only in terms of environmental impacts but also with respect to socioeconomic changes (Blassingame, 2012). In Psychology of Sustainable Development, a collection of papers on environmental psychology, Elisabeth Kals and Jürgen Maes of the University of Trier in Germany identify several factors contributing to engagement in sustainable behaviors. Some of the most important elements include "ecological awareness" about environmental problems, the belief that one's actions exert a substantial influence on the extent of ecological damage, and "emotional affinity" toward nature. Hence, the question of how people can be induced to accept sustainable practices becomes partially a question of how their awareness of the natural world and their emotional connection to it can be reinforced. Nonetheless, some scholars in sustainability studies are unfortunately inclined to discuss environmental issues in ways that seem unlikely to promote greater public understanding of ecological concerns and support for sustainability initiatives. Wood, for instance, advocates the use of urban design in a "frankly manipulative" manner that involves "a process of 'seeding' consensual change". Later he writes, "Not surprisingly, consumer-centred, representative democracy has conspicuously failed to wean us from a way of life that threatens us with extinction."

Results of the "human-benefit" cities

Kals and Maes explain that "ecological fear" of detrimental effects from the environment on one's well-being has only a minor impact on behavior. "Hidden behind the blindness of our suicidal cultures is an insidious biophysical poisoning."(Peter, 2011). On the basis of both the theoretical and practical aspects of urban sustainability, one can develop a new framework for assessing efforts to create more sustainable communities.

This proposal recognizes that climate change and ecological degradation occur on a global scale, and that efforts to protect and restore the environment require widespread public support across nations and social groups. Any solution must emphasize community participation in urban planning and, most importantly, combine environmental benefits with demonstrable improvements for residents 'quality of life.

Ultimately, the concerted and inventive application of these ideas in urban communities throughout the world should result in the development of what might be called "human-benefits" cities that would secure broad advantages for both the health of the natural environment and the standard of living for all inhabitants. These cities would embody the central principle that ecologically sustainable communities should simply be authentic and attractive cities in general, with lower pollution, improved health, greater social solidarity, and a strong appreciation for the beauty and complexity

of nature. The "human-benefits" perspective does not fix any particular objectives other than ecological protection. Some cities might pursue social justice, some might strive for economic revitalization, and others might concentrate on cultural and educational opportunities: the "experimental" method allows each city to follow the priorities of its own residents. With this proposal, developers and municipal officials would eschew externally designed master plans in favor of broadly supported initiatives arising organically from recognized local concerns.

"Human-benefits" cities would focus on incentives for adopting sustainable behaviors rather than penalties for violating environmental regulations, seeking to maintain the interest and engagement of businesses and residents. This recommendation is inspired by the findings of Karen Umemoto and Krisnawati Suryanata, professors at the University of Hawaii at Manoa (Karen, 2006). They discuss the use of "informal social contracts" to develop trust and reciprocity between a mariculture company and local inhabitants and to resolve conflicts over environmental impacts without expensive litigation. In the same manner, instead of an excessive reliance on legal constraints, cities can dissolve contention by implementing a problem-solving methodology that attempts to achieve advantages for all parties involved.

Furthermore, the "human-benefits" approach would encourage the construction of new communities only in environments naturally suitable for human life, not in inhospitable deserts or ecologically fragile rainforests (Lau, 2012). Using locally sourced building materials and supporting research into sustainable technologies would yield not only more sustainable patterns of construction, but also benefits for the local economy. Most importantly, this proposal would offer more opportunities for innovation, greater public participation in civic decisions, and even more personal freedom. As Hall argues, "If there is an argument for higher densities and particular urban forms, it is far more that these give people more choice, not less: freedom to take good public transport rather than be car-dependent, freedom for their children to walk or bike to school rather than being ferried by car.

This approach solves the problem of ecological awareness and motivation, not by erecting an entirely new system of environmentally conscious values and ethics, but by drawing on the interest that humans have perennially placed in their own health, their communities, and improved living conditions for their families.

Conclusions

Applying this analysis to Masdar City specifically, one can identify clear disadvantages for the project, especially since the planning process has been controlled by the government for its own purposes, rather than responding to the concerns and desires of the local community. Indeed, the city is isolated from any other community by the surrounding deserts, and the high concrete base would prevent Masdar from being naturally integrated with any nearby neighborhoods that might exist in the future, raising the issue of social exclusion. Moreover, while eco-cities are generally new developments, ecological security should be extended to the less privileged by focusing on retrofitting and behavioral change in existing cities. Nevertheless, the "experimental" method does not demand that myriad ecological and social objectives all be advanced by a single initiative: as Blassingame notes in his article, sustainable development is a process, not a final product. Even if it is lacking in certain respects, Masdar City represents profound progress in the central task of demonstrating the feasibility of a

"human-benefits" city that purposefully connects environmental protection, economic opportunity, and an improved quality of life in a unified and potent vision. Specially designed, self-contained eco-cities can be effectively used to stimulate sustainable development in existing neighborhoods, but their architects should expect them to be incorporated into the larger community as environmentally conscious design is more broadly adopted in the future.

But as population growths and needs energy efficient housing, cooling, water desalination and renewable energy solutions as energy consumption starts bumping up against oil and gas production jeopardizing exports so vital to Gulf country economies. As the global population continues increasing, all sources of energy will be required and projects like Masdar City can help advance renewable energy technology, which is projected to make up an increasing share of the global energy mix.

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Challenges of the Japanese energy sector

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Abstract. *The energy sector in Japan presents certain particularities that have contributed to the country's economic development. The paper examines these specificities in relation with the Japanese energy demand. The article also aims to describe the evolution of the energy branch in Japan from the end of the Second World War until the 2011 Fukushima Daiichi nuclear disaster with suggestions for balancing the Japanese energy mix in the future. Japan has deficiencies in reserves of fossil fuel, except coal, and relies heavily on imports of crude oil, natural gas, and other energy resources. This is the main reason why Japan developed a strong energy research and development program supported by the government in order to boost the country's energy efficiency. The shortage of natural resources also determined nuclear energy becoming a national strategic priority in Japan, even though there had been ongoing concerns about the nuclear reactors' capacity to operate efficiently when confronted with Japan's oft-repeated seismic activity. While Japan had arrived to rely on nuclear power to accomplish more than one fourth of the country's necessities of electricity, after the 2011 Fukushima Daiichi nuclear disaster all nuclear reactors have been gradually shut down due to security reasons. With many reservations in August 2015, the Sendai Nuclear Power Plant was brought back online being in 2016 the only nuclear power plant functioning in Japan. However, Japan finds nowadays itself in the position to redefine its future energy structure, promote renewable sources of energy and re-evaluate from technological and economical points of view the status of all nuclear plants.*

Keywords: Japanese energy sector, nuclear power, energy efficiency, natural resources in Japan

Introduction and literature review

Energy in Japan states for energy and electricity production, consumption, import and export in the Japanese land. It is a widely known fact that Japan lacks important national reserves of fossil fuel, with the exception of coal, and finds itself in the position to depend on imports of crude oil, natural gas, and other energy resources, including uranium. The country based its energy domain on oil imports which met around 40-45 percent of its energy needs in the last five years. Japan was also the first coal importer between 2010 and 2015 and also the first natural gas importer. Even though Japan had previously counted on nuclear power to fulfill about one fourth of its electricity market demands, after the 2011 Fukushima Daiichi nuclear disaster all nuclear reactors have been gradually closed down for safety concerns. As of January 2013 many Japanese cities with nuclear plants expressed their willingness of restarting their activities and it was substantiated on August 11, 2015, when the Sendai Nuclear Power Plant was brought back online, succeeded by the Takahama Nuclear Power Plant on January 29, 2016. As of February 2016, Japan has restarted a total of three nuclear reactors.

BP, formerly known as British Petroleum publishes yearly a strategic report which offers an overview of the key activities, events and results of each year, together with information on the company's markets. For 2014 and 2015 the BP strategic reports included snapshots of the challenging Japanese energy market which served as a starting point for the body of this scientific paper.

The Institute of Energy Economics, Japan was established in June 1966 and certified as an incorporated foundation by the Ministry of International Trade and Industry in September that year. The aim of its establishment is to carry on research activities specialized in the area of energy from the viewpoint of the national economy as a whole in a bid to contribute to sound development of the Japanese energy-supplying and energy-consuming industries and to the improvement of people's life in the country by objectively analyzing energy problems and providing basic data, information and reports necessary for the formulation of policies. With the diversification of social needs during the three and a half decades of its operation, IEEJ has expanded its scope of research activities to include such topics as environmental problems and international cooperation closely related to energy. The Institute of Energy Economics, Japan has been conducting specialized research activities in the areas of environment and energy economics for 50 years. According to the 2015 Go To Think Tank Index from the University of Pennsylvania, the Institute progressively gained recognition and now ranks Best Energy Think Tank in the World. One of the strongest publications of the institute, which study contributed to the development of this paper is the yearly EDMC Handbook of Japan's & World Energy & Economic Statistics which for the editions of 2014 ad 2015 has stated that the global energy situation is changing constantly, often in dramatic and very complex ways. The two editions exemplify the Great East Japan Earthquake of 2011 which has given rise to serious difficulties in the formulation of energy and nuclear power policies not only for Japan but for many countries around the world and necessity for a stable and secure supply of energy is the bedrock of our daily lives and economic activities (EDMC, 2014, 2015).

The Energy White Papers are reports submitted to the Japanese Diet annually outlining energy measures taken during the previous fiscal year. The Energy White Papers for 2014 ad 2015 constituted important bibliographical inspirations for this paper as their main topics provide analysis on the global environment for energy

security and also explain the current situation of rising energy costs in Japan and the Government's response to the situation. In addition, the 2014 and 2015 White Papers also describe in detail the responses to the accident at Tokyo Electric Power Company's (TEPCO) Fukushima Daiichi Nuclear Power Station, energy trends, and measures taken in FY 2013 and 2014 concerning energy supply and demand.

Description of the energy mix in Japan

Japan's economic history is one of the most studied in the world, mainly due to its spectacular boom following its defeat in World War II, becoming, a few decades after, the second economy in the world. The Japanese economy, assessed in terms of the gross domestic product (GDP), has shown a rapid growth, especially between 1960 and 1980. In 1991, the so called "Japan's economic bubble" collapsed, ushering the beginning of a slower economic growth, which continues to this day (Nicolescu, 2006). The energy sector is showing specific characteristics that have contributed to the economic progress of the country. In Chart 1, the trends in the energy sector are shown and the evolution of the economic indicators for Japan, according to the studies of the Nautilus Institute for Security and Sustainability. In 1973, the energy consumption per GDP unit diminished after the first "global oil crisis" (period when the international oil prices increased rapidly due to the limited supply and the control of prices by the major producers).

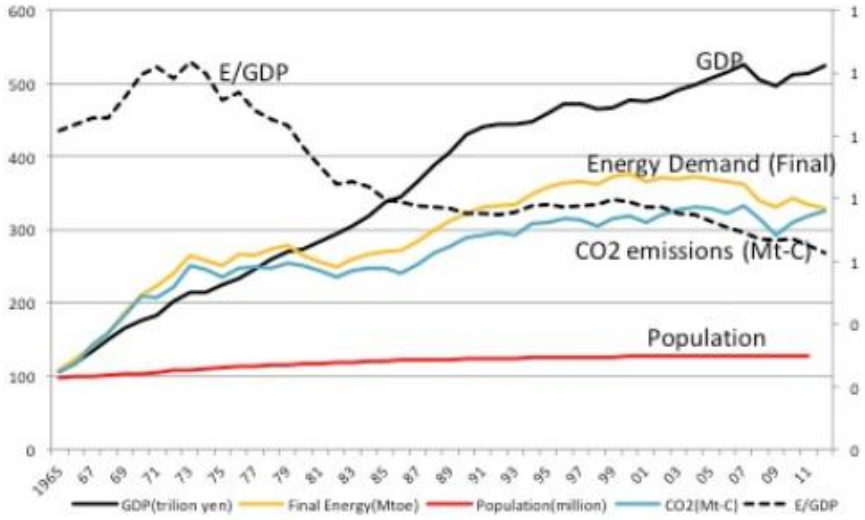

Chart 1. **Trends in the energy sector and the evolution of the economic indicators for Japan**

Source: Nautilus Institute.

Following the first oil crisis, energy demand in Japan continued to grow for most years, but at a lower rate than the gross domestic product. Also, the carbon dioxide emissions (CO2) continued to increase, but not as much as the energy demand, partly due to the development of nuclear energy as of 1970.

Whilst coal and hydropower sources were the main energy production sources for the 1950s Japan, they were replaced by oil during the '70s, while coal still maintained a fairly important share. After the second oil crisis in 1981, Japan recorded an increase in the use of nuclear energy and natural gases, mostly imported as liquefied

natural gases and used directly as fuel for final use and for electricity generation, reaching to provide between 20-30% of the primary energy needs of the country, as it can be seen in Chart 2 (EDMC, 2014).

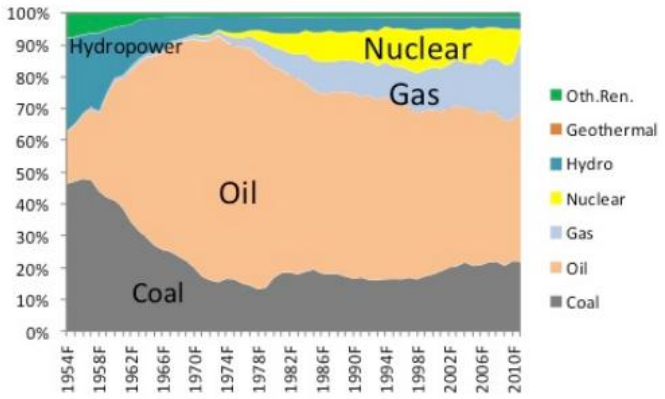

Chart 2. **Main sources for energy generation in Japan**
Source: Handbook of Energy & Economic Statistics in Japan, 2014.

Electricity was mainly generated by thermal and hydroelectric plants until 1970, when the first nuclear power plants emerged. Nuclear sources accounted for 30% of the electric power generation until the incident at the Daiichi Fukushima power plant in March 11th 2011, when the power plant was damaged by a devastating tsunami caused by the 9 magnitude earthquake that hit Japan. The accident triggered the greatest civil nuclear crisis after the one in Chernobyl (Ukraine) in 1986. Following the Fukushima accident, all nuclear power plants in Japan were closed for thorough safety assessments and retrofitting processes, as reflected by the lower nuclear energy share for 2011 (Chart 3) (METI,2014).

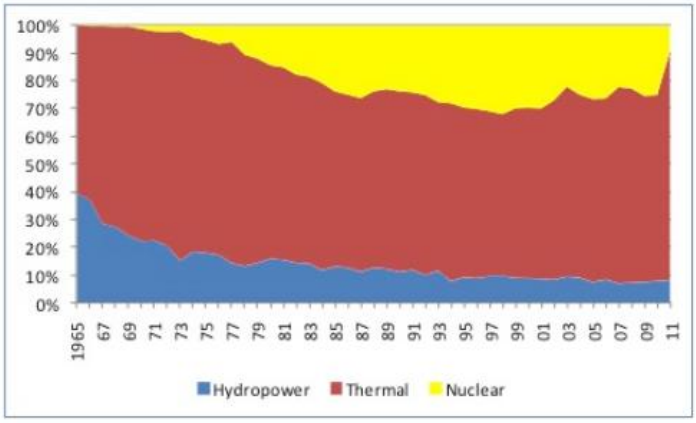

Chart 3. **Main resources for electric power generation**
Source: METI (2014), Monthly report on electric power statistics.

Until October 2014, none of the nuclear reactors in Japan were retaken into service. However, the Sendai nuclear power plant, the first to be compliant with the tightened rules enforced after the accident at the Fukushima Daiichi power plant in 2011, was brought back online being in 2016 the only nuclear power plant functioning in Japan.

Thus, it can be concluded that the energy sector in Japan presents two specific characteristics: the first - less beneficial to the economy, and the second (positive), places Japan among the first countries in the world in terms of research and development.

The first particularity refers to the dependence of this country, and its economy respectively to the imported fossil fuel savings; Japan owns very few natural energy resources, with an own energy capacity of only 16%. According to the Annual Statistical Review of World Energy prepared by the BP Company and published on the bp.com website in June 2014, Japan is the world's third largest oil consumer after US and China, respectively the third largest net importer of crude oil. Japan is also the world's largest importer of liquefied natural gas (LNG) and the world's second largest coal importer (BP, 2014).

To reduce this dependence, the Japanese progressively turned to nuclear energy, which unfortunately, presents high risks when facing natural hazards - as was the case with the accident at the Fukushima Daiichi nuclear power plant in March 2011. The incident successively caused all nuclear reactors to be shut down, which led to the return to fossil fuels, whose use Japan wished to diminish, precisely due to their scarcity in Japan (Takase, 2014).

This brought on the increase of CO2 emissions, for which Japan has set a 3.8 percent attenuation objective in 2020 compared to 2005, but the greenhouse gases emissions increased in 2013 to the equivalent of 1,395 billion tons of carbon dioxide, the highest score since 1990 according to the Ministry of Environment in Japan.

The second characteristic of the Japanese energy sector is favorable to the economy and is represented by the very high energy efficiency. Despite the lack of adequate domestic hydrocarbons resources, Japanese companies have actively pursued participation in global projects on oil and natural gases and provision of engineering, construction, financial as well as project management services for projects in the energy area around the world. Japan is one of the main exporters of equipment in the energy sector, with a strong research and development (R&D) program encouraged by the government, which aims domestic energy efficiency measures, in order to enhance the country's energy security and reduce carbon dioxide emissions.

Looking into the future: objectives of Japan's New Energy Plan to 2030

Japan has completed in early in 2015 a new and revised energy plan, recognized as 3E+S+M, which targets to expand nuclear power's electricity generation share to 20–22% by 2030. According to the plan, renewable energy input will record a percentage of 22–24%, while Liquefied Natural Gas (LNG) will supply 27%, coal 26% and oil 3%. In selecting the best energy mix for the future, Japan must consider its choices carefully from what can be called the "3E+S+M" perspectives. The first perspective is energy security (E1). As a nation with no energy resources to speak of (energy self-sufficiency currently stands at just 4%), Japan needs to position its energy security as a core factor in measures necessary to support its people's daily lives and economic activities. The second perspective materializes as environment (E2). Some 90% of the greenhouse gases produced by human activity are carbon dioxide emitted during energy generation. Energy policy is inextricable from the global warming problem, and an integrated approach is required that takes both sides into account. The third perspective of economic efficiency (E3) establishes that a stable, affordable supply of energy is a must

to ensure reliable livelihoods for the people and maintain industrial competitiveness. The fourth perspective which is safety (S) suggests that sufficient consideration must also be given to the safety of energy use and provision.

The last perspective of the plan - macroeconomic impact (M) supports the fact that some policy choices have the potential to negatively impact the lives of some of Japan's people or some economic activities in the country; there is a need to keep this impact (rising electricity costs, lower GDP growth, and the like) to as low a level as possible.

The various energy sources at Japan's disposal all have different characteristics, and none of them are perfect—they all have negative factors of some kind (Murakami, 2012).

The objectives of the new energy plan need to be underlined and they can be described as following (METI, 2015):

Providing the Japanese energy market demands

After the 2011 Fukushima nuclear disaster, Japan based its energy needs on fossil fuels in order to accomplish its demand target. Still, large expenses on gas and oil imports expanded the country's expenditure by $270 billion in 2013 face to 2010, driving the national debt to $8.78 trillion in March 2015.The new energy plan targets to diminish Japan's reliance on fossil fuel imports, lowering their electricity production share from the current 87% in 2015 to 56% by 2030. This measure will support the country to quadruple push its energy self-sufficiency, from the 2015' 6% to 24% in 2030.

Reducing Carbon Emissions

Mostly because of the expansion of fossil fuel-based power generation, Japan's greenhouse gas emissions climbed to a worryingly high 1.395 billion tons of carbon dioxide in 2013, the highest recorded total since comparable data became available in 1990. However, 3E+S+M will enable Japan to reduce its emissions by 26% from 2013 levels by 2030. Using 2013 as a baseline, this represents a higher figure than the EU's 24% cut by the end of 2030 and the US' 18–21% reduction by 2025.

Lowering Electricity Prices

According to a survey by the Japan Chamber of Commerce and Industry between September 2013 and August 2014, electricity prices were 28.1% higher than in the fiscal year immediately following the Fukushima disaster. Additionally, the increase in fossil fuel import costs and the nationwide Feed-in Tariff (FiT) program has increased electricity prices by 30% for industry users and 20% for residential consumers. As a consequence, Japan's energy plan also aims to reduce the share of electricity generated from high-cost fossil imports, especially oil, which is planned to decline from 8% to 3% by 2030.

Maintaining Nuclear Reactor Safety

To help increase nuclear power's electricity generation share to 20–22% by 2030, Japan's 4th Strategic Energy Plan (SEA) has proposed restarting nuclear units. These plants are based on a new post-Fukushima design and would be restarted following Nuclear Regulation Authority confirmation that they adhere to new regulations.

It is believed that Japan should adopt the right mix of energy sources to achieve its 3E+S+M policy objectives. Although each source poses its own constraints, it is crucial that Japan devises a policy that supports and increases its reliance on

domestically available renewable sources to attain long-term self-sufficiency. While nuclear addresses current problems, it may not be a lasting solution to issues surrounding electricity prices and greenhouse gas emissions when technology, such as solar PV, can be deployed for large-scale commercial and residential use. A nuclear share of 10–15% by 2030 would be enough for Japan to move towards self-sufficiency and increase the share of renewable in its energy mix.

Conclusion

Following the nuclear accident at Fukushima, the energy mix in Japan is due to change, as natural gases, oil and renewable energy gain market share, replacing part of the nuclear fuel. Following this incident, the conservative political decision-makers in Japan have encouraged the new companies in the renewable energy market by means of various stimulants, this type of energy (especially photovoltaic systems) reaching up to ensure 9.4% of all energy consumed at national level in 2015 as compared to 8.2% in 2012.

Nevertheless, there are still certain issues to be revised in terms of the future of Japanese energy policy. Japan wishes to achieve the greenhouse gas emissions objectives, but must find that efficient energy mix, without walking into the trap of substantially restarting the nuclear sector and maintaining, at the same time, an open mind towards renewable energy. For all these vulnerabilities, rapid and efficient measures must be taken, with the background of an energy policy and an economy with multiple issues still unresolved. Will Japan regain, in the near future, its title as the world's second economic power or will decline even more in front of powers like India or Russia?

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Oil and gas upstream - old problems - new solution

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Abstract. *The fossil energy resources today ensure 87% of energy consumed worldwide. This percent will have a slow abatement until 2035 and will be around of 81%. However the oil and gas industry periodically faces crisis which provoke big economic and social problems. The industry big players are used to do business as usual and the old problems still do not have a solution in a new century. The topic is treated by the all most important players on the market, like British Petroleum, Halliburton; Schlumberger or Qatar Petroleum and others. Also there are a lot of materials issued by Ernst and Young; pwc; Oxford Centre for the Analysis of Resources; IDC Energy Insight; McKinsey&Company and others. The research was focused on finding out if the solution proposed by the author could be met in the causes and consequences of the oil crisis of the last 15 years. Also a big attention was paid to the other solutions proposed by different authors for overcoming the present crisis and to prevent the next ones. Ultimately was established that most of the solutions proposed are on the trend line of business as usual and no one underline the advantages of letting information being shared between players of oil and gas market. The present paper is proposing to get an intro into present oil price crisis. To bring a better understanding that to avoid such catastrophic consequences, as we face today, the oil and gas companies need to split the causes and to find solutions for each of them, not just to try to amortize all together through total cost reduction and huge profits during periods of price climbs. The paper brings some hints about a solution for the huge costs in upstream equipment and services, business.*

Keywords: oil and gas, price crisis, upstream, equipment, services.

Introduction

The scope of the work is to present the problem that Oil and Gas (O&G) Industry faces today and to propose a new approach as a solution. A new wave of price crisis is tumbling over the O&G market for the last one and a half year. It called the close of a huge number of projects, due to enormous costs of operating in upstream of O&G and caused the layoffs of tens of thousands employees.

During the last 40 years it were five major price crisis and the todays one is the 6th. Regarding to macrotrends.net, the frequency of price crises in O&G is 5-10 years, which leads to a high intension of investments and expenditures during the ascending and top periods, and to a major reduction of investments and assets closing during descending and bottom periods. The rush for big investments during the ascending and rapid cuts after that, leads to very high costs for services in upstream. This marathon of investments, of Exploration and Production (E&P) companies, causes a blow of the prices on the service market and involve over resources to cover the demand of the market share, which each company aims to achieve. The service companies' feasibility studies overview the sinusoidal trend of the market and build their market strategy on short-medium terms, gaining maxim profit during the ascending period and a switch to a total cost cuttings, in a very short terms, during bottom periods to save the profit.

In 21st century O&G, as an energy resource, maters. Regarding to BP Energy Outlook (February 2015), by 2035 all the fossil fuel shares (Coal, Oil, Gas) are clustered around 26-28% with no single dominant fuel. Fossil fuels in aggregate lose share but remain the dominant form of energy in 2035 with a share of 81%, down from 86% in 2013. Among non-fossil fuels, renewables (including biofuels) gain share rapidly, from around 3% (February 2015) to 8% by 2035, overtaking nuclear in the early 2020 and hydro in the early 2030s. Roughly one-third of the increase in energy demand is provided by gas anther third by oil and coal together, and the final third by non-fossil fuels.

The object of this study is upstream segment of O&G industry. The E&P activity is one of the most expensive. It depends directly on investment ability of the company and it faces the impact of any crisis, first of all. Upstream being hit, affects the entire industry chain, in long term basis. Companies require a long period for reanimating the on hold projects and to start new ones. All of this, in a situation of closed contracts for materials, equipment and services, with no human resources. This why is so important to find business instruments to reduce costs of operating in E&P and to amortize the impact of oil and gas price fluctuation. Service companies and equipment vendors should have tools of remaining on the market with minimum costs, if even the activity is very slow and to be ready for an enforced start, anytime the market requires it.

Crude oil price crisis and its consequences

Having a look of the oil price crisis during the last 15 years, we can easy see that the most affected segment of the industry was upstream. There are a lot of factors that affects upstream more than other segments of the industry.

A quick look back - Despite a modest and uneven global recovery from the economic downturn of 2008–09, the oil and gas industry nevertheless enjoyed a lengthy run of success, as geopolitical instability and uncertainty affected oil supply, underpinning higher prices for crude. In early January 2009 — following the collapse of global stock markets just a few months earlier — Brent crude was trading around US$42 per barrel. Yet, only two years later, as the Arab Spring moved into Libya,

curtailing almost all production, prices surged to more than US$100 per barrel, reaching more than US$125 per barrel in early May. And, aside from a few brief dips in mid-2012 and early 2013, Brent prices generally stayed above US$100 per barrel until September 2014. [1]

Those high prices, in turn, have underpinned the shale or light tight oil (LTO) production surge in the US, with US oil production growing by more than 1 million barrels/day (b/d) in each of the last three years. These unprecedented increases in production were, however, largely masked (and essentially matched) by the geopolitical tensions and uncertainties, primarily in North Africa and the Middle East, along with a host of smaller, unplanned supply outages. As a result, even with only modest oil demand growth, from early 2011 to mid-2014, oil markets broadly "balanced," with prices averaging more than US$100 per barrel. However, by mid-2014, with some of the production outages restored, particularly in Libya and Iraq, US$100 per barrel oil in the face of weak oil demand led to a structural oversupply of oil, thus beginning the slide in oil prices. With OPEC voting in late November 2014 to maintain production levels, coupled with Saudi Arabia seeking to maintain its market share (and not be the 'swing producer"), the slide in prices accelerated. By late January 2015, Brent crude prices had dropped below US$50 per barrel, more than 60% below their most recent peak in mid-June 2014. [1]

It did not take long for the industry to respond, with deep cuts to capital budgets and substantial staff layoffs announced in early 2015 at more than a handful of companies, including many big players. Greater clarity on oil and gas companies' capex plans is leading to further downgrades in 2015 E&P spending forecasts. According to Wood Mackenzie, oil and gas companies have cumulatively slashed their 2015 upstream budgets by 24%, by US$120 billion (based on announcements from 116 companies). Independents have embarked on significant spending cuts (around 33%), followed by National Oil Companies (NOCs) (27%) and International Oil Companies (IOCs) (12%). Meanwhile, Barclays has revised its January upstream spending estimates and now expects North America E&P spending to fall by 30.2% and international spending by 19.3%, (vs. 12.5% and 8.5%, respectively, as per the earlier estimate).[1]

And wholesale gas has had its own ups and downs. Gas prices started decoupling from oil prices, crating uncertainty and negatively influencing both oil companies and their customers. To preserve profitability in these challenging times, oil and gas companies must maintain operational efficiencies while minimizing risks.[2]

The price cuts is not the only challenge that Upstream O&G companies have to face. There also is an increasing demand on investments for remain valuable on the market. The E&P companies need to increase their reverse-replacement ratio, which has been seriously harmed. Financial Times says that the proven reserves recently discovered fell 24 % in 2014, to 2.3 billion (barrel oil equivalent) boe and has nearly halved from 4.4 billion boe in 2011. In consequences, the landscape for upstream oil and gas companies is shifting at an unprecedented pace. The production of conventional sources of oil and gas is relocating to more remote, more difficult, and more expensive parts of the globe. This inevitably leads to higher projects costs and higher risk on capital returns. The last decade, first time for all over the last 50 years, the classical oil resources that have been operational, became depleted. The E&P companies have to look for new resources, implementing new technologies of exploiting, like drilling deep wells for shale hydrocarbons, moving the assets into new regions with no infrastructure – deep waters, Antarctica etc. The E&P companies are operating in increasingly remote

geographical locations and harsher environmental conditions, with unconventional processes to extract hydrocarbons.

The national biggest E&P Company, Petrom S.A. faces the same problems as all other big international players. For keeping the production trends, Petrom S.A. needs to pay more contribution, for the Neptun Deep, Black Sea project, where is in partnership with ExxonMobil. In 2015 Petrom S.A. has completed drilling of 4 wells in Black Sea, Doplphin-1; Pelican South 1; Flamingo-1 and Califar-1. Petrom S.A. says that the exploration activities will continue in 2015 and the results of the studies obtained from drilling will be useful for the evaluation of the potential of the reservoir. Regarding to profit.ro, Petrom S.A. has spent $1.5 billion, starting with 2008 for the Neptun Deep project. The costs are equivalent shared between partners – Petrom S.A. and ExxonMobil.

Also, Petrom S.A. has kept investing in Kazakhstan's fields TOC and Komsomolskoe, where for keeping the reservoir pressure and for the optimization of production is running a process of water injection.

The E&P companies need to make strategic decisions about which projects should be developed first to ensure their company best performance. Then there are decisions about equipment resources, like when is the best time to reserve a rig? Should the decision be based on getting the best rate even if the rig will not be needed at that exact moment, or should a firm wait until the exact date for a drilling project is known and risk the equipment not being available, or the threat of higher rental rates? How does an equipment shortage impact planned revenues, or do key decision makers have the ability to review this information and prioritize projects based on equipment resources? Meanwhile, due to constant remoting the projects locations and very dynamic trends of layoffs and hiring, the same resource issues are faced for human capital tied to exploration and production projects. Are the appropriate teams in place for a project, or has an unexpected failure at another location impacted the project? [3]

The problems pictured above, leads the oil and gas companies to constantly seek ways to improve efficiency, reduce costs and minimize risks. While many upstream companies have neglected materials management in the past, the potential for future savings without major investments is becoming difficult to ignore. Upstream companies have long pursued the latest strategies to improve profits. They renegotiated contracts with service companies, applied strategic sourcing to reduce equipment costs, and improved maintenance activities to reduce costs and turnaround times. [2]

Few companies, however, have spent time or effort on optimizing materials management. A primary focus has historically been on availability of materials for production or projects rather than costs. This trend has driven by risk aversion, lack of tracking systems, and complicated supply chains, with a variety of parties involved in both the operations of existing assets and the execution of capital projects. Making necessary materials available for production sites and projects is vital, as costs of a missed day of production or delay in the first oil date are significant. But there is also an opportunity to reduce costs of running assets or executing capital projects without compromising availability. [2]

Logistics costs are incurred to guarantee the flow of materials from suppliers to the development or production site along with storage and inspection costs. These costs typically represent up to 15 % of total operating expenditures and can be as high as 30 % depending on location of exploration, development, or operations. Average

production costs of a major global oil and gas company are approximately 10$ per barrel of oil equivalent (excluding taxes and royalties). A company producing a million barrels of oil equivalent per day will spend $3.5 billion per year, with logistics costs ranging from $175 million to $525 million. Cutting 10 percent of these costs can lead to as much as $50 million in savings – a significant amount. [2]

Regarding to economica.net, in T2 of 2015, Petrom S.A. have had a production of 174.000 barrels of oil equivalent per day. The production costs of Barrel of oil equivalent in T2 of 2015 was 12.65 $ per barrel of oil equivalent. Applying a simple math calculation, reveals that Petrom S.A. spends from $12 million to $25 million per year, only for the logistics of materials.

Saving money on logistics is only the beginning. Greater savings still can be found in minimizing wasted materials, which on a micro level may seem insignificant, but taken as a whole can create huge savings. Oil and gas majors spend from $15 billion to $30 billion a year on capital projects, about 10 % of which is contingency. [2]
Excessive contingency provision applied by engineering and procurement as well as changes in design of the asset along the project life cycle result in high levels of surplus materials Of that 10 % of contingency materials, up to half ends up as a surplus stock, discarded scrap and spares. Most of the loss is because of obsolescence, poor cross-project cooperation, insufficient system integration, and improper handover from project status to operations. This waste can lead to annual losses of up to $1 billion – enough to fund significant development projects. [2]

Finally, while safety stocks is required to protect from unforeseen events, excessive stock leads to missed opportunities. Focusing only on availability of materials can lead to excess purchasing, creating building and creasing cost of capital. Reducing material storage time in capital projects, can free up much as $2.5 billion. In operations, material stock held by the upstream divisions of oil and gas companies varies from $1 billion to $2 billion, so a 10 % reduction, can release as much as $200 million, significantly reducing cost of capital. [2]

On another side of the market are Oil Field Service (OFS) companies. Some of this are the biggest employers on the planet and the biggest investors in research and development in technology and industry, and know they face the similar problems. Although these companies do not get the headlines or even the stock market attention of the oil and gas producers they serve, they have been the backbone of the recent rapid expansion in resource exploration — and they have enjoyed the fruits of outsized capital spending campaigns that increased year over year. As the firms that provide the equipment and technological know-how for hydrocarbon exploration and production — ranging from 4-D seismic services to horizontal drilling — OFS businesses played an indispensable role in helping international oil companies (IOCs) and national oil companies (NOCs) enhance oil and gas production yield during a boom that saw global oil reserves increase 27 percent to 1.7 trillion barrels between 2003 and 2013 and natural gas reserves grow 19 percent to 186 trillion cubic meters during that time. In this flourishing marketplace, OFS companies generated impressive financial results. Industry sales have grown at a compound annual rate of 11 percent since 2005, to reach US$440 billion last year.[4]

A primary reason that oil-field services companies have been so successful is their record of innovation. As the shale and unconventional resource revolution

widened, OFS firms continued to push the envelope with breakthroughs like multistage fracking, which gives a shale project access to multiple wells and resource beds; steerable rotary bits that reduce drilling time by some 50 percent; and pad drilling, which lets companies target a wide swath of underground reserves from a proscribed region on the surface. Their ability to innovate made OFS companies attractive partners for hydrocarbon producers, especially NOCs, which pay them fees for their services but don't have to give them equity stakes in the reserves the way IOCs sometimes do. [4]

The top five companies by market share — namely, Schlumberger, Halliburton, Baker Hughes, National Oilwell Varco, and Weatherford, according to the latest stock exchange data — stand out by the depth of their scaled operations and the width of their footprints. Together, they control about one-third of oil-field services business. That leaves a myriad of smaller players with a combined majority share, hoping to stake a claim to some slice of the business. A few of these smaller, often younger, companies have become so emboldened that they ventured into the domain of the IOCs, acquiring assets to operate themselves (Petrofac's Malaysian offshore holdings are a good example). [4]

However, the smooth ride for OFS companies has suddenly turned bumpy. At first blush, it would seem that the obvious reason is the dramatic collapse in oil prices since June 2014, when a barrel of Brent crude cost about twice of what it does today. Under scrutiny by shareholders to demonstrate greater financial discipline even before prices tumbled, the large oil and gas companies have begun to rein in spending quickly, hoping to wipe out the negative effects of their historically large capital expenditure programs that have produced relatively insignificant production gains. Indeed, industry analysts expect that capital investment budgets globally will be slashed by as much as 10 percent this year — and oil-field services companies will increasingly bear the brunt of the reduced construction activity in lost business. Compounding this revenue hit, IOCs are likely to seek new, discounted contracts with OFS players to make up for weaker oil prices. Simply put, the impact of the price collapse cannot be underestimated. In a matter of months, oil-field services companies have lost about $210 billion, or about one-third, of market capitalization. And recent financial statements have been disconcerting. In its third-quarter 2014 results, Transocean booked a charge of $2.79 billion for the drop in the value of deep water rigs and warned that more write-downs were possible. More recently, Transocean cut its dividend by 80 percent. In addition, Petrofac warned investors of a "difficult period" due to troubled North Sea assets and lower oil prices. But the sharp downturn in oil prices is too glib an answer for what ails the oil-field services sector — and those viewing this problem as purely a cyclical pricing concern will make the mistake of neglecting Viewing the problem as purely cyclical neglects the fundamental survival threats that OFS companies face. In fact, the recent boom period in the sector was a bit of a mirage — a golden era that hid the many shortcomings that had begun to infect these companies. In the current environment, these weaknesses are exposed. Although few observers have called attention to these issues, throughout the growth period many OFS companies have actually suffered falling profit margins as development, labor, and project costs soared; prices of raw materials vacillated; poorly chosen acquisitions failed to meet growth, synergy, and integration targets; and complexity with its attendant costs to business and organizational models increased in tandem with demand. Between 2009

and 2013, year-over-year profit margins at each of the five OFS majors have been flat or declined by as much as 5 percent. Typical of the costly organizational complexity that strained OFS companies and their margins was the establishment of such noncore activities as venture funds to invest in risky infrastructure projects and educational arms to train oil company employees in skills development, as well as periods of over hiring (and sometimes paying a premium for new employees) to ramp up quickly as business expanded. How rapidly the OFS sector has moved from rarefied air to the roughand-tumble that is commonplace for most companies. Yet OFS firms are not without strategic options. Today's choices may be more arduous and risky than those of the recent past, but aggressive and farsighted management teams can still steer their companies into a position of strength that would allow them to successfully navigate the current lull in prices and to anticipate the next rise. These strategic options fall into four categories: contracting and pricing, cost management, integrated offerings, and portfolio optimization. [4]

Solution

To find out the solutions for the present crisis and to prevent a similar situation when the oil and gas price will come again to slide, we should split de overview on the problem and to focus on each part of it. E&P industry, is one of the most old-fashioned and conservative industry. On business as usual model, which has not fundamentally been developed for the last 40-50 years companies meet a bucket of problems that are ignored in the race of ongoing projects and being excused and amortized by big profits during the climb periods of oil and gas prices. This issues come to light, when some turbulences appear on a medium-long term basis on the market. The budgets of exploration and exploitation projects, are consumed mostly by the cost for the equipment, services and management of delivering it on the position.

The problems faced by E&P companies are multiple and thickens the budgets through large terms for overcoming them. As it was pointed above, the E&P companies, have to decide the financial and technical priority in contracting some equipment and services. It may be contracts for a cheaper price if it is booked long before the project starts. This imply the uncertainty of the spud date and to pay a long term stand by tariff for the equipment and services contracted. On another hand, E&P companies may do all the preparation (technical calculations/optimizations & getting approvals), without contracting OFS companies in advance, in order to be more precisely with spud date but to have to contract them in a big rush, risking to do not have available services on the market, to pay an extra over rate, and to support huge costs for a rush relocating of the OFS companies infrastructure. In both cases, the costs are huge and it becomes unfeasible during crisis periods.

On the other side OFS companies have to keep a big number of employees on sales department, in order to stay in touch with E&P companies. Keeping in touch means visiting all big and little offices of the E&P companies, to present their technical innovations on the market and to find out when new projects are going to come, which region and what kind of project. This visits are an iteration of the sales representatives of each product line separately, of every big OFS company – try to imagine what an army of sales is permanently - 24/7 on the way, paying visits, looking for opportunities to sell. The paradox of this is that E&P companies, as it was presented above, has the same

interest to buy, but do not do anything to share their necessities easier. The price of the sales army, is also on the bill payed by E&P companies, only the quality and amount of information given and obtained in both direction is uncertain.

The solution proposed below is about getting all the upstream market players together, on virtual space where they could share information which is going to reduce costs.

The E&P Companies will share:

1. *Projects which are involved in. The technical projects that are in progress and that are upcoming*. Each project manager shares the projects that are approved and update the status of those permanently. This will imply the geographical location, technical data of the project and the rough specification of the period that it is planned to be in place.

2. *Stocks of materials*. The stocks of unused materials, from previous projects that are on warehouses cost billions and the E&P companies, usually do not have what to do with them, usually being much more cheaper to buy new materials for the new projects in a different geographical area than move the existed ones through a whole cargo chain. But these ones could be useful for other E&P of OFS companies on the same geographical area.

3. *The fleet of equipment that it is in use, but needs to be replaced in short-mid-term.* The E&P companies only by sharing this information, will receive a lot of proposals directly from trusted vendors, without doing mostly anything. This will help E&P companies to take advantage from Research and Development (R&D) activity of OFS companies and keep their equipment fleet technological updated.

The OFS companies will share:

1. *The portfolio of services.* Each company (to be understood as each subsidiary from different geographical position) will share the portfolio of services that it offers. The equipment used for this, the team with all the qualifications for each member.

2. *The equipment/technical innovations.* OFS companies use to rent/sell equipment to E&P companies, but also between them. Having a 24/7 exposal to all E&P companies from the region of interest, would decrease the number of sales that are responsible with promoting and increase the demand for the equipment and services.

Getting all players together on a common virtual place, will do the upstream market more predictable for all players, which will decrease the risks of investments. Sharing the information will have the effect of a better planning of future projects, will reduce unused stocks. Will access the contact information for the specific person for the immediate and right information needed, without delays and risks of getting wrong information. Having the information of all the warehouses of all the players on the market, could make much simple the cargo chain for the equipment to remote locations. This is a high priority in case of an emergency need during of an ongoing project. The portfolio of services and equipment is easy to access and the exposal is much more comprehensive, than visits to the offices one by one.

The above list should be completed with all other advantages that an online market space brings to business. The upstream market still does not fully use the 21st century technology, but we certainly can say that the industry has the willingness for such changes. A good example for this could be such sharing web portals like

rushmorereviews.com or rigzone.com, but for sure it is a place for much more to do in this direction.

Conclusion

The O&G industry is leading the today industry and the whole world, being the most important source of energy resources. This is one of the most expensive and creating the most added value economic sphere. The evolution of it, creates opportunities for a major developing of the economies of whole countries and the declining of it, can seriously harsh the global economy. The experience of the last 15 years with no less than 3 crises of oil price and the most important, the very serious and long term consequences of it, should put in guard all the involved players to get solutions. The O&G industry today, acts like a teenager, which was a spoiled child and do not want to grow up. The 21st century offers solutions for the old fashioned problems that O&G and particularly upstream industry face today. A simple exercise of imagination, that the 5 E&P majors: British Petroleum; ExxonMobil; Total; Shell Dutch Royal and Conoco Philips on one side, and 5 OFS majors: Schlumberger; Halliburton; Baker Hughes; National Oilwell Varco and Weatherford on another side, meet on the same online platform to trade the business opportunities between them. It will become long term, most effective damper for the shocks on the market. This article aims to provide you with food for thought while encouraging healthy debates and discussions. All the data a proven and are obtained from different trusted sources.

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Strategic choices in energy sector during the recent financial crisis

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Abstract. *We analyze financing and profit distribution decisions of companies activating in energy sector before and during the financial crisis. Using a worldwide database we are able to put in evidence determinants of the capital structure in energy sector. An equally important decision for a company is how the benefit is divided between dividends and reinvestment. In this respect, we studied the circumstances related to the decision of energy companies to distribute a part of the profit as dividends. Our analysis revealed that size, profitability and asset structure, but also macroeconomic characteristics have a role in shaping the strategic financial choices of energy companies.*

Keywords: Capital structure, payout policy, energy sector

Introduction

The strategic financial decisions such as capital structure and payout policies have a tremendous importance for the future of a company, but in shaping its image in investors' eyes. This is why financial literature manifests a great interest in analyzing corporate behavior in terms of borrowing and dividend distribution. Both subjects have a great importance for a wide range of participants on the capital markets including investors, creditors, issuers and financial analysts.

Despite the great importance of the subject and the wide interest manifested in the economic literature, the study of the strategic decisions of energy companies remains scarce. The reason behind this paradox is that capital structure and divided policy are usually dealt with in a comprehensive context including a wide range of industrial sectors. Two important exceptions are usually considered in the literature due to the specific regulation that influences the corporate strategic decisions, namely the financial sector and the energetic ones. Due to the specificity of the regulation, the strategic choices in energy sector remain less studied, although very interesting for the financial management in energy companies, but equally for investors and analysts.

The present paper is dedicated to the study of the behavior of energy companies regarding debt and the preferred sources for borrowing capital, as well as regarding their decision to distribute dividends. Our main findings reveal that energy companies that use long term financial debt more often are big firms in developed countries, with lower performance and lower asset tangibility. The industrial profile, but also the ownership structure may have a role in determining the choice of the borrowers. Financial indicators, but also the ownership structure are also expected to influence the decision of the companies regarding dividend distribution.

The remaining of the paper will be organized as follows. The second section will regroup some empirical considerations regarding the determinants of the strategic choices of a company, the third part will explain database and methodology and will emphasize some statistical facts in order to put in evidence the particularities of the energy sector. The next part is dedicated to presenting the results and their financial implications, while the sixth part concludes.

Theoretical considerations

A wide range of literature is dedicated to understanding the behaviour of the companies regarding the use of borrowed capital. Starting with the well-known conclusion of Modigliani and Miller (1958) stating that if particular conditions hold the capital structure choice is neutral in shaping the company value, continuing with the effect of the fiscal saving on the capital structure and later on with numerous papers concerning the determinants of the capital structure (Deesomsak et al., 2004; De Jong et al., 2008; Delcoure, 2007; De Miguel et al., 2001; Nivorozhkin, 2005; Rajan and Zingales, 1995).

Among the main factors put in evidence in the literature as determinants of the capital structure profitability, asset tangibility, size, growth opportunities, non-debt tax shields are enumerated as microeconomic determinants, while the level of economic development, measured by the gross domestic product per inhabitant, the degree of development of the capital market, inflation or interest rate are macroeconomic indicators that influence the financial leverage. Higher asset tangibility is related to the existence of the collateral appreciated by the financial institutions and therefore a positive relation is expected between financial debt and asset tangibility (Chui et al., 2002.) The correlation between financial debt ratio and profitability is more complex. The pecking order theory states that a company prefers internal financing and will

borrow only the remaining part of the needed capital, therefore a negative influence of the profitability is expected on the financial debt ratio, while the signaling theory favors a positive correlation due to the supplementary controlling realized by the bank that increases the investors' trust. Size is also correlated to increased warranties for the lender, therefore a positive correlation is expected. Growth opportunities are expected to increase the interest manifested by the investors on the capital market, hence relieving the need for borrowed capital, hence a negative correlation is expected between price/book ratio and the leverage indicator (Fan et al.,2008; Gonzales and Gonzales, 2008; Gianetti, 2003). Regarding the macroeconomic conditions that influence capital structure choice, De Jong et al (2008) show that the economic development measured by the GDP per inhabitant may have a role in explaining the debt ratio.

Our approach considers the factors enumerated above, but adopts a more in-depth approach analysing the determinants of long term financial debt, short term financial debt and commercial debt. There are studies arguing that the debt maturity depends on the level of trust in the society, but also on several macroeconomic conditions such as the level of economic development and the importance of the capital markets in facilitating capital transfers in the society (Dragota, 2005; Dragota et al., 2013). Energy companies are characterized by big dimensions, lower risk due to their adherence to the utilities sector and low return. it is interesting to understand if in this particular sector, the general conclusions of the financial literature apply.

Regarding the decisions of the companies to distribute dividends, the main conclusions of the literature reveal several factors that influence dividend policy. A negative correlation is evidenced between leverage and dividend payout ratio (Agrawal and Jayaraman, 1994; Goyal and Muckley, 2013; Naijar, 2009), while Denis and Osobov (2008) empirically prove the role of profitability, growth opportunities and size on dividend distribution.

Database and methodology

In order to understand the specific determinants of the capital structure and dividend distribution decision we apply a panel analysis with random effects on a sample of 313 companies belonging to the energy sector belonging to 60 countries for the period 2005-2010. The companies are those included in the most important national index in their countries and belong to five major groups: electrical power producers, gas related activities, mining, coal and oil related activities. The data was provided by Thomson Reuters Datastream database.

In order to understand the main particularities of the companies in the energy sector, we present the average financial indicators in energy sector versus a sample of regular companies belonging to the same indexes:

Table 1. *Definition of the variables used to analyse strategic choices in the companies in energy sectors*

Variables	Definition	Total sample Average (%)	Energy Average (%)
Long term debt ratio in book values	$\frac{Long\ term\ financial\ debt}{Total\ assets}$	15.93%	18.56%
Short term debt ratio in book values	$\frac{Short\ term\ financial\ debt}{Total\ assets}$	11.48%	7.83%
Commercial debt ratio in book values	$\frac{Commercial\ debt}{Total\ assets}$	22.80%	21.47%

Source: Authors' own processing.

As shown above, companies in the energy sector tend to be a little bit more indebted than the average on a long run, while the opposite is concluded on a short run. Regarding the commercial debt ratio, the average indicator does not vary significantly between the two samples.

Regarding the factors of influence put in evidence in the previous section, the following statistics resulted:

Table 2. *Definition of the variables used to analyse strategic choices in the companies in energy sectors*

Variable	Definition	Average (total Sample)	Average (Energy)
Tangibility (%)	$\frac{Total\ assets - Current\ assets}{Total\ assets}$	54.53	62.03
Size1	ln(net sales)	6.585	6.75
Profitability (%)	$\frac{Net\ profit + Interest\ expenses}{Shareholders'\ equity + Financial\ debt}$	8.68	10.22
Price to book value ratio**(PBV)	$\frac{Market\ value\ of\ equity}{Book\ value\ of\ equity}$	2.427	2.39
Dividend payment	1, if the firm paid dividends in a given year and 0 otherwise	0.723	0.72
Liquidity	$\frac{Current\ assets}{Current\ debts}$	1.468	2.54

Source: Authors' own processing.

As expected the tangibility in the energy field is higher than the overall average due to the huge infrastructure necessary to produce and transport energy, while the size is higher than in the average company.

A somehow unexpected finding is related to the profitability of the energy companies that seems almost 15% higher than in the average company, despite the general view that energy companies have low risk and therefore are expected to obtain lower returns also. The explanation resides in the period on which the database is constructed, namely the period of the financial crisis that favours the companies with an inelastic demand. The average price/book value as well as the percentage of the companies that distributed dividends is in line with the total sample. Regarding the liquidity, energy companies benefit from a high level of liquidity which makes them more attractive for creditors.

Results

The analysis of the capital structure choice in energy companies was made according to the debt maturity. Table 3 shows the determinants of the long term financial debt ratio in energy companies.

Table 3. *Long term financial debt determinants*

Variable	Coefficient	t-Statistic	Prob.
SIZE	0.022193	3.026084	0.0025
PROFITABLITY	-0.002388	-5.719774	0.0000
TANGIBILITY	-0.099138	-2.525821	0.0117
PBV	0.007708	2.022776	0.0433
GDP PER INHABITANT	3.80E-06	5.623296	0.0000
FOREIGN SHAREHOLDERS	-0.001333	-4.048124	0.0001
STRATEGIC SHAREHOLDERS	0.000541	3.237947	0.0012
POWER PRODUCERS	0.269878	4.414801	0.0000
GAS PRODUCERS	0.165076	5.005302	0.0000
RENEWABLE ENERGY PRODUCERS	-0.049087	-0.815912	0.4147
MINING AND MINING SUPPORT	-0.060026	-1.709318	0.0877
COAL	-0.021295	-0.521373	0.6022
TRUST	-0.000232	-0.444381	0.6569
C	0.007542	0.085169	0.9321
R-sq	0.1304		
DW	1.52		

Source: Authors' own processing.

The empirical results suggest that big energy companies in developed countries rely on long term financial debt more than others. The negative coefficient of the profitability indicator suggests that energy companies appeal long term loans when their own internal sources are insufficient, the result being in line with the pecking order theory. We also notice a surprising influence of the tangibility and growth opportunities indicators. The influence of the tangibility indicator is expected to be negative corresponding to the need of the creditors to secure their loans. On the other side, creditors are reluctant to borrow resources to companies with high price to book values which are generally small companies, supposed to be financed mostly by the owners through share issues.

The present results are to be considered in correspondence with the time span of the analysis in the sense that the lenders' and borrowers' behavior is specific to the financial crisis with a relaxed credit policy in the first years which is a risk accumulation period.

Specific features in energy sectors are related to a positive influence of a strategic holder on the financial debt ratio, while in energy companies with foreign participants to the capital, long term financial ratio is lower. Regarding the influence of the specific sub-sector on the long term debt ratio, the results suggest that power and gas producers rely on debt more than other energy companies, while mining companies have lower long term debt ratios.

An equally interesting analysis is that of the preference of energy companies for short term financial debt. Table 4 presents the results of the empirical analysis of the short term financial debt ratio determinants.

Table 4. *Short term financial debt determinants*

Variable	Coefficient	t-Statistic	Prob.
TANGIBILITY	-0.118882	-5.867479	0.0000
PROFITABILITY	-0.000776	-2.894862	0.0039
SIZE	0.006150	1.818535	0.0692
PBV	0.002796	1.528051	0.1267
GDP	-6.14E-07	-1.937173	0.0529
DIVIDEND DISTRIBUTION DUMMY	-0.022049	-2.631498	0.0086
LIQUIDITY	-0.001896	-4.259139	0.0000
C	0.143646	4.597280	0.0000
R-sq	0.11		
DW	1.73		

Source: Authors' own processing.

Our findings suggest that energy companies in less developed countries appeal more often short term financial debt. This may be the result of more restrictive credit conditions corroborated to the lower risk level of energy companies, which allow them to obtain lower financing cost with shorter debt maturities. The companies that have a higher short term financial debt ratio are big energy companies with lower tangibility and profitability, in line with our previous conclusion. Companies relying more on short term financial debt are those that do not distribute dividends and have lower liquidity ratios, which shows that energy companies appeal short term financial debt for liquidity reasons. The sub-sector is not important when it comes to short term financial debt.

The short term financial debt contracting is often related to commercial debt for which it is often a substitute. Table 5 presents the determinants of energy companies behavior regarding commercial debt.

Table 5. *Commercial debt determinants*

Variable	Coefficient	t-Statistic	Prob.
SIZE	0.011565	2.426512	0.0154
TANGIBILITY	-0.347735	-14.92997	0.0000
PBV	0.005202	2.841758	0.0046
PROFITABILITY	0.000326	1.311612	0.1899
BETA	0.015184	1.268533	0.2049
CORRUPTION	0.004812	1.858388	0.0634
LIQUIDITY	-0.001015	-2.258730	0.0241
POWER PRODUCERS	-0.053238	-3.140467	0.0017
GAS PRODUCERS	0.007799	0.386644	0.6991
COAL PRODUCERS	0.000790	0.027035	0.9784
MINING AND MINING SUPPORT	-0.046770	-2.128905	0.0335
RENEWABLE ENERGY PRODUCERS	-0.094818	-1.593312	0.1114
TRUST	5.62E-05	0.152914	0.8785
C	0.276367	5.037287	0.0000
R-sq	0.38		
DW	1.53		

Source: Authors' own processing.

The results suggest that commercial debt is used in a bigger extent by big energy companies, with high price to book ratios and lower tangibility and liquidity. It is to be noticed that commercial debt is used in a bigger proportion in countries with low perceived corruption where creditors see their rights better protected. Power producers and mining companies seem to have lower commercial debt ratios than the other energy companies.

Another strategic decision of energy companies less studied in the literature is that regarding dividend distribution. We created a dummy variable equal to 1 for companies that distributed dividends during the year and 0 otherwise and by means of this variable we studied the probability of the energy companies to distribute dividends.

Table 6. *Dividend distribution determinants*

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PROFITABILITY	0.054236	0.005004	10.83761	0.0000
SIZE	0.323201	0.039047	8.277199	0.0000
TANGIBILITY	0.716373	0.197043	3.635608	0.0003
CORRRUPTION	-0.121422	0.022381	-5.425247	0.0000
GDP	1.51E-05	3.00E-06	5.035188	0.0000
BETA	-0.351083	0.100515	-3.492824	0.0005
C	-1.769882	0.341890	-5.176761	0.0000

Akaike info criterion	0.895249
Schwarz criterion	0.918298
Hannan-Quinn criter.	0.903879

Source: Authors' own processing.

The results suggest that big energy companies with high profitability, lower market risk and a big proportion of tangible assets are more prone to distributing dividends. Also dividend distribution is more probable in developed countries than in less developed ones. As regarding the sign of the corruption coefficient, it can be explained by the fact that in countries with lower perceived corruption the investors are more willing to leave the entire profit to be used by the company, while in countries with a higher corruption, the role of dividends as signaling instruments is more pronounced and energy companies are more prone to distribute dividends signal their financial soundness.

We also considered the role of ownership structure and sub-sectors in shaping the decision of the companies to distribute dividends and the results are listed in table 7.

Table 7. *Dividend distribution determinants*

Variable	Coefficient	z-Statistic	Prob.
PROFITABILITY	0.047614	9.120755	0.0000
SIZE	0.368046	7.166489	0.0000
TANGIBILITY	0.821818	3.524138	0.0004
CORRUPTION	-0.129914	-4.866209	0.0000
GDP	1.50E-05	3.772957	0.0002
BETA	-0.266605	-1.892469	0.0584
FOREIGN	-0.018274	-4.831174	0.0000
STRATEGIC	0.002943	1.513615	0.1301
GOVERNMENTAL	0.034048	4.570415	0.0000
POWER	0.331059	0.848360	0.3962
GAS	0.644816	2.293799	0.0218
COAL	0.159397	0.959576	0.3373
RENEWABLE ENERGY	-1.295626	-1.899756	0.0575
MINING	0.028951	0.165198	0.8688
C	-2.074787	-4.794916	0.0000

Akaike info criterion	0.792350
Schwarz criterion	0.856405
Hannan-Quinn criter.	0.816489

Source: Authors' own processing.

Energy companies with foreign ownership are less likely to distribute dividends, while those where the government is part of the ownership are more prone to dividend distribution. The explanation can reside in the fact that foreign ownership is more active in controlling the management, the signaling role of the dividends fading in this case. Regarding the preference of state-owned companies to distribute dividends, the result may be related to the fact that these companies are usually big mature ones that have the means to distribute dividends.

Gas producers have a higher preference for dividends, while renewable energy producers are less likely to distribute dividends. The explanation can be that renewable energy sector includes younger companies that probably did not reach their maturity and still need financial resources to sustain their growth.

Conclusions

The financial choices of energy companies are less debated in the literature due to the specific regulatory features that do not allow including them in the overall samples used to analyze capital structure and dividend distribution decisions.

Our analysis focus exclusively on energy companies during 2005-2010 period. One important finding is that during the time span of our analysis energy companies surpassed the regular ones in terms of return. The results show that profitability negatively influences debt ratios in energy sector, while bigger companies appeal debt more often. Long term debt is preferred in developed countries and short term financial debt ratio is higher in less developed ones. The foreign ownership is associated to lower debt and lower dividend distribution preference suggesting that foreign owners are interested in reducing the debt risk of their companies and have other means to control the management, hence deciding not to distribute dividends. On the other side, companies with majority ownership rely more heavily on long term debt. The result is in line with the assumption that major shareholders seek to preserve their decision power, preferring debt to share issuance. Considering energy sub-sectors, power and gas producers have higher debt ratios than other energy companies.

Regarding the dividend distribution, bigger and highly profitable companies are more prone to distribute dividends. A stronger dividend distribution preference has been noticed for gas companies, while renewable energy producers are less likely to distribute dividends.

We need to stress that the time span of the analysis covers the financial crisis period. A similar analysis may be useful for the subsequent period in order to understand in what way the financial crisis changed the behavior of energy companies regarding capital structure and dividend distribution decisions.

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Strategic models for corporate entrepreneurship in the renewable energy field

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Abstract. *Depending on their characteristics, established companies that want to invest in renewable energy adopt different strategies, which provide different financial and non-financial outcomes. This paper presents a qualitative analysis of the strategic models of corporate entrepreneurship in the renewable energy field. This includes the analysis of correlations between selected strategies used to categorize companies into the defender, analyzer and prospector typologies of Miles and Snow (1978), and outcomes of corporate entrepreneurship: strategic renewal, innovation outcomes, organizational outcomes, financial outcomes, enhanced reputation, new businesses and new ventures. The study is based on the current body of literature and data collected from 30 companies that have undertaken a corporate entrepreneurship strategy in the renewable energy field. The studied enterprises were both companies without an energy background, which broadened their portfolio by entering the renewable energy market, and providers of conventional energy that diversified their domain of activity by investing in renewable energy. Differences between the strategic models and the corporate entrepreneurship outcomes of the two categories of investors are underlined. Findings of the study may support the formulation of renewable energy support systems, by offering insight into the entrepreneurial strategies of companies that invested in renewable energy. For organizations, results could contribute to the understanding of the correlation between the selected strategies and corporate entrepreneurship outcomes in the renewable energy field.*

Keywords: corporate entrepreneurship, renewable energy, strategic models, corporate entrepreneurship outcomes, innovation.

Introduction

In the context of increased public interest to drive cleaner energy generation, the creation of support systems for renewable energy and governmental measures to reduce greenhouse gas emissions, companies were driven to adapt their strategy in order to assure profitability on the long run (Klose et al., 2010). Energy companies such as oil multinationals acted differently by opposing governmental taxation policies or by investing in renewable energy as part of their cooperation towards a cleaner environment, in line with their corporate social responsibility strategy (Levy and Kolk, 2002). Proactive companies that were among the first to invest in renewable energy considered that early investments were necessary in order to gain competencies and capitalize on first mover advantages (Levy and Kolk, 2002).

The advantages of adopting a proactive strategy are described in the categorizations of Miles and Snow (in Miles et al., 1978), who grouped companies according to the strategy which they use in order to adapt to environmental changes in prospectors, analyzers, defenders and reactors. Correlating the four strategic typologies to corporate entrepreneurship dimensions, the prospector represents a proactive company who takes risks, innovates and benefits from first mover advantages, contrasting with the reactor, who is risk-aversive and unresponsive to technological, structural or market changes.

While the renewable energy field has lately profited from lower costs, improved technologies and new markets (REN21, 2015; Nyquist, 2015), further business model and technological innovation are needed in order to further sustain its growth. Outlining the advantages which companies benefit from by investing in alternative energy could make the sector of renewable energy more attractive to both energy and non-energy companies. While financial performance of companies investing in renewable energy varies respective to their business model (Loock, 2011), the company's strategy can also influence non-financial outcomes, such as the innovation ability of the company. In this regard, assessing the strategies of companies that have invested in renewable energy, and their effect on the company's overall performance, could provide an improved perspective for future investors, as well as an insight into the characteristics of companies that can drive innovation in the renewable energy field.

Literature review

Strategic corporate entrepreneurship refers to strategic entrepreneurship practices implemented within established organizations, while strategic entrepreneurship is the result of intersecting the concepts of strategic management and entrepreneurship in order to pursue new business opportunities, while capitalizing on the internal resources and capabilities of the organization (de Villiers-Scheepers, 2012).

The strategy model of Miles and Snow (in Miles et al., 1978) can be efficiently integrated into corporate entrepreneurship research given its focus on the company's ability to adapt to the changing business environment.

The prospector typology proposed by Miles and Snow (in Miles et al., 1978) is characterized by high levels of proactiveness and environmental scanning. The analyzer model corresponds to companies that want to maintain a stable core of activities, while implementing innovation depending on the environment (Daft and Weick, 1984). According to Doty et al. (1993), analyzers are characterized by a dual focus, aiming at

increased efficiency and also approaching new product and market development. In contrast, defenders keep a limited product-market domain, while focusing on efficiency. Reactors do not have a clear strategy and are usually characterized by a risk-aversive posture.

First mover advantages may rely on different aspects: proactive companies may benefit from market share gains by attracting environmental conscious clients, enhance their reputation, while also reducing risks related to new liabilities (Percy, 2013). On a different level, first-movers can achieve technological leadership and reduced costs through organizational learning and experience (Lieberman and Montgomery, 1988).

Previous studies have correlated corporate entrepreneurship to financial performance (Zahra, 1991; Antoncic and Hisrich, 2004). However, companies can also benefit from non-financial factors. Kuratko's (2007) model for the corporate entrepreneurship process includes both financial and non-financial outcomes of the entrepreneurial activities, split into managerial and organizational consequences for the company. The company's ability to innovate is also an effect of corporate entrepreneurship activities included by Kuratko (2007), expressed through more innovations and an increased innovation capability of the employees.

Research methodology

Overview of the research design

The research relies on a qualitative analysis which was performed on data gathered from 30 entrepreneurial companies that have diversified their domain of activity in the renewable energy field. The data collection phase took place between January 2013 and February 2014, when structured interviews were sent to managers involved in the renewable energy business within the selected companies. These were active in the main renewable energy sectors: wind power, solar power, hydropower, biomass, bio fuel, geothermal energy and renewable energy enabling technologies.

Given the important roles which market incumbents and new entrants have in the transformation of the energy market, half of the data sample was constituted of companies with an energy background, while the other half was formed by companies without an energy background.

Nineteen of the companies that participated to the study are international players that are active in Europe, the Middle East and Africa.

Methods

The strategic model of the companies was assessed based on the median ratings for five business strategy items on a 7-points Likert scale. Ratings of 1 to 2 corresponded to the defender typology; ratings between 3 and 5 described the analyzer typology, while ratings from 6 to 7 corresponded to the prospector typology. The reactor typology wasn't considered, due to the author's assumption that companies engaging in corporate entrepreneurship activities should fit to one of the previous three strategic groups.

Outcomes of the corporate entrepreneurship initiative were also rated on a 7-points Likert scale, respective to the degree of impact which the investments in renewable energy had on them.

The multiple case studies approach (Eisenhardt and Graebner, 2007) was used in order to underline the differences between the strategic models of the categories of companies investing in renewable energy in terms of primary domain of activity, size, and the chosen renewable energy technology.

Correlations between business strategies and corporate entrepreneurship outcomes were assessed using the Kruskal-Wallis test and the Spearman correlation coefficient in SPSS.

The research instruments

The set of questions regarding the business strategy of the company is based on items previously included in a corporate entrepreneurship study performed by Lekmat and Chelliah (2011), based on the measurement instrument developed by James and Hatten (1995).

All items for corporate entrepreneurship outcomes except "new businesses", "product/service innovation", "process innovation" and "competitive aggressiveness" were included from Kuratko's model (2007).

The research sample

The largest share of the studied companies was represented by small or middle sized enterprises: 19 of the respondents are companies with 1 to 50 employees (small companies), 7 are companies with 50 to 500 employees (medium-large), while 4 companies have more than 500 employees (big corporations).

Among the interviewed companies, most investments in renewable energy were done in solar energy (13 respondents). Wind power, hydropower and biomass were represented by 8 of the respondents each. The renewable energy fields in which the interviewed companies have least invested are enabling technologies (4 companies) and geothermal energy (3 companies).

Results

Analysis of the business strategies in the renewable energy field

Results showed that the business strategy of the studied companies was closer to the analyzer typology (Figure 1).

One third of the surveyed companies considered that the "first in market" item describes their business strategy: 3 energy companies and 7 companies with no energy background rated this item with at least 6. "Rapid response to opportunity" was rated with a high score by 16 companies, out of which 10 where non-energy organizations. "Taking calculated risks" was rated with at least 6 by 9 energy companies and 5 non-energy companies. "Aggressive product and market innovation" and a "broad product-market domain" were considered to describe the company strategy of only 8, respectively 6 companies.

Although ratings for items such as "first in market" and "rapid response to opportunity" were higher in the case of non-energy companies, there is no overall significant difference between the characterization of business strategies of energy and non-energy companies that have invested in renewable energy. This is caused by variances of the respondent's answers respective to each business item included in the study.

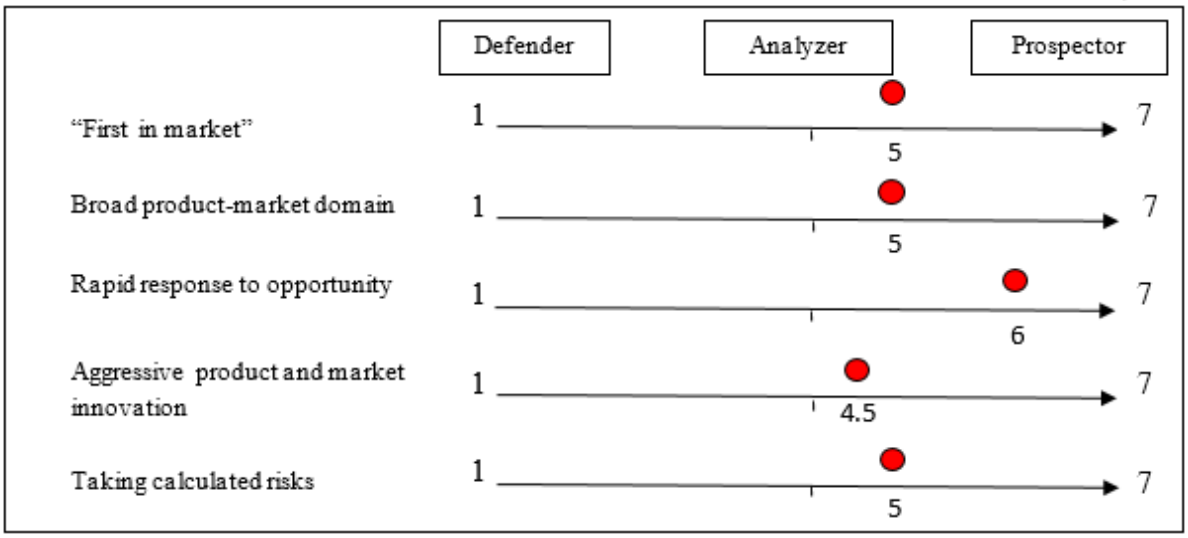

Figure 1. **Evaluation of the business strategies items**

Source: Author's own research.

While energy companies prefer a broad product-market domain more than non-energy companies do, non-energy companies are more willing to capitalize on first mover advantages. Companies without an energy background also seem to adapt to environmental changes faster than energy companies do, given the higher ratings of the "response to opportunity" item (Table 1). Energy companies have also shown a higher preference for taking calculated risks, which was also suggested by the number of respondents from the energy sector that rated this item higher than 6.

Table 1. *Median ratings of the business strategies items*

	"First in market"	**Broad product-market domain**	**Rapid response to opportunity**	**Aggressive product and market innovation**	**Taking calculated risks**
Energy	4.50	5.00	5.00	4.50	6.00
Non-energy	5.50	3.50	6.00	4.50	5.00
Small	4.00	4.00	5.00	4.00	5.00
Medium-large	7.00	5.00	7.00	5.00	6.00
Corporations	4.50	4.50	4.50	4.50	5.50
Wind power	5.00	3.00	5.00	3.00	5.50
Hydropower	4.50	3.00	6.00	5.00	5.50
Solar power	5.00	5.00	6.00	4.00	6.00
Biomass	5.00	3.00	6.50	4.00	5.00
Bio fuel	2.00	3.00	2.00	4.00	5.00
Geothermal energy	4.00	5.00	5.00	2.00	6.00
Enabling technologies	5.00	5.00	6.00	4.00	5.00

Source: Author's own research.

Medium-large companies included in the study seem to adopt a strategy closer to the prospector typology. Companies that have attributed higher ratings to the business strategy items have mostly invested in solar power and enabling technologies.

Analysis of corporate entrepreneurship outcomes in the renewable energy field

Overall, innovation outcomes and organizational outcomes were rated lower than the financial outcomes. However, respondents considered all outcomes included in the study to be positively impacted by their corporate entrepreneurship initiatives in the renewable energy field (Table 2).

Table 2. *Corporate entrepreneurship outcomes within the studied companies*

Category	Outcome	Item rating (median)
	Strategic renewal	5
Innovation outcomes	Product/service innovation	5.5
	Process innovation	5
	More innovative behavior	5
Organizational outcomes	Competitive aggressiveness	5
	Development of value creating core competences	5
	Effective strategic adaptation	6
	Increased organizational knowledge	6
Financial outcomes	Improved financial performance	6
	Improved market share	6
	Enhanced reputation	6
	New business	6
	New ventures	5

Source: Author's own research.

Taking into account that all corporations (companies with over 500 employees) that participated to the study are energy companies, results of the corporate entrepreneurship outcomes showed that "strategic renewal" (with a rating of 6) and an enhanced reputation (with a rating of 6.5) have been valuable effects for energy corporations that have invested in renewable energy.

All innovation outcomes have been more impacted in the case of non-energy companies, with a rating of 6 for product/service innovation and innovative behavior, as opposed to 5 in the case of energy companies, and ratings of 5 versus 4.5 for process innovation. This is also the case for organizational outcomes, which were rated overall higher by non-energy companies. Innovation items were rated higher by medium-large companies, with ratings of 6 for the three items, as opposed to average ratings of 5.2 and 4.3 in the case of small companies and corporations.

"Increased organizational knowledge" and "enhanced reputation" have been equally rated by energy and non-energy companies, while "effective strategic adaptation" was rated slightly higher by non-energy companies (with a rating of 6 as opposed to 5.5 in the case of energy companies). This finding underlines the fact that not only do energy companies need to invest in renewable energy in order to fight possible liabilities and the price volatility for conventional energy sources, but non-energy companies also consider that investing in clean energy is an effective adaptation to the environmental changes.

Analysis of the correlation between business strategies and the corporate entrepreneurship outcomes

The Kruskall-Wallis test retrieved 26 significant results, out of which two were discarded for further analysis for failing the Levene test. "Aggressive product and

market innovation", the business strategy item with the lowest rating, wasn't significantly correlated to any of the entrepreneurship outcomes included in the study.

The Spearman correlation coefficient was further computed. Only the pairs of variables which passed the Kruskal-Wallis test were considered for analysis. All significant correlations were positive, suggesting that higher ratings of the strategy items are correlated to a more positive evaluation of corporate entrepreneurship outcomes (Table 3).

Table 3. *Spearman correlation coefficients for corporate entrepreneurship outcomes and the business strategy of the company*

Corporate entrepreneurship outcomes	Spearman results	First in market	Broad product-market domain	Rapid response to opportunity	Aggressive product and market innovation	Taking calculated risks
Strategic renewal	Coeff.	0.539	0.578	0.449	0.322	0.697
	Sig.	0.002*	0.001*	0.008*	0.047†	0.000*
New ventures	Coeff.	0.237	0.178	0.170	-0.026	0.289
	Sig.	0.112	0.182	0.193	0.448	0.068
New businesses	Coeff.	0.580	0.364	0.317	0.225	0.242
	Sig.	0.001*	0.031†	0.050†	0.130	0.112
Product/service innovation	Coeff.	0.511	0.448	0.316	0.352	0.213
	Sig.	0.003*	0.008†	0.050†	0.033†	0.139
Process innovation	Coeff.	0.545	0.499	0.487	0.433	0.209
	Sig.	0.001*	0.003†	0.004*	0.011†	0.143
Competitive aggressiveness	Coeff.	0.360	0.375	0.334	0.457	0.496
	Sig.	0.030†	0.025†	0.041†	0.007†	0.004*
Development of value creating core competences	Coeff.	0.588	0.612	0.590	0.375	0.526
	Sig.	0.001*	0.000*	0.000*	0.025†	0.002*
Effective strategic adaptation	Coeff.	0.486	0.666	0.456	0.433	0.478
	Sig.	0.004*	0.000 †	0.007*	0.011†	0.005*
Increased organizational knowledge	Coeff.	0.388	0.553	0.453	0.326	0.486
	Sig.	0.021†	0.001**	0.007**	0.045†	0.004*
More innovative behavior	Coeff.	0.596	0.394	0.425	0.136	0.423
	Sig.	0.000*	0.019†	0.012†	0.245	0.012†
Improved financial performance	Coeff.	0.327	0.323	0.095	0.221	0.271
	Sig.	0.045†	0.047†	0.308	0.129	0.078
Improved market share	Coeff.	0.451	0.511	0.262	0.124	0.534
	Sig.	0.008*	0.003†	0.085	0.265	0.002*
Enhanced reputation	Coeff.	0.566	0.371	0.199	0.365	0.426
	Sig.	0.001*	0.028†	0.151	0.031†	0.012†

Source: Author's own research.

*significance at 0.01 level

† failed the Kruskal-Wallis test

Results suggest that strategic renewal and the development of core competences are the corporate entrepreneurship outcomes most influenced by a strategy closer to the prospector typology, among the studied outcomes. The strongest correlation for strategic renewal was with the strategic orientation of taking calculated risks.

The "first in market" strategy was the business strategy item most correlated to all three innovation outcomes: product/service innovation, process innovation and innovative behavior.

The second strongest correlation which was identified during the analysis was between the development of core competences and a broad product-market domain, followed by the correlation between the development of core competences and a rapid response to opportunity.

Discussion

Although the studied companies show a high preference for a fast response to opportunity, characteristic to the prospector typology, they are best described by the analyzer model, which suggests that companies that have engaged in corporate entrepreneurship activities in the renewable energy field wish to maximize their opportunity for profit, while taking calculated risks.

In terms of innovation, answers suggest that the studied companies prefer product development and incremental innovation to radical technology improvement and innovation. However, once a new technology is brought to market, they tend to respond fast and introduce the new product in their portfolio. While there were no significant differences in the overall strategic positioning of companies with no energy background and energy companies, non-energy companies seem to respond more rapidly to new opportunities than energy companies do, and would prefer a "first in market" strategy more than energy companies would.

Results further suggest that product and market innovation in the renewable energy field may rely on medium-large companies, which hold capital and are financially solvable but also have the flexibility to invest in new technologies and innovate their business models. Capitalizing more on first-mover advantages may also be the reason why non-energy companies have had a higher impact on the innovation outcomes of the company than energy companies did.

The findings of the research underline the importance of non-financial outcomes which can result from corporate entrepreneurship activities in the renewable energy field. Investing in renewable energy has represented a strategic renewal opportunity for energy corporations, while assuring an effective strategic adaption to the new environmental changes also for non-energy companies.

The correlation between innovation in the renewable energy field and a "first mover" strategy highlights the need to support early innovators through specific programs for R&D and technological development. Fostering collaboration between smaller companies and energy corporations, as well as between the private and the public sectors may also be an efficient strategy for innovation.

Limitations of the study are driven by the small sample size and the subjectivity of the given answers. However, further research could rely on the present results, and develop strategy, innovation and organizational assessment instruments for a better evaluation of the strategic models.

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Current public perceptions on the development of wind parks in the European Union. Case study: Romania and the Netherlands

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Abstract. *Wind farms have become a permanent component of the residential landscape for many regions of the European Union and worldwide. Although the benefits of clean sources of energy are a necessity for a sustainable future of mankind and the efforts against climate warming and pollution, citizens around the globe have different perceptions on the presence of wind turbines in the landscape, as they are expanding closer to residential areas. This study intends to offer an overview of public perceptions of wind turbines depending on possible locations based on a sample of answers from 64 Dutch citizens and 40 Romanian respondents. By using the Delphi method based on questionnaires and interviews, the respondents have provided specific aspects of public reactions towards wind farms in the two analysed countries. The main findings of the research included the willingness of the respondents towards a financial effort on encouraging wind energy, which unexpectedly brought the Romanian citizens on the first position, but also the importance of financial benefits for locals and the surface morphology of their placement for the increased acceptance of these projects.*

Keywords: wind energy, perceptions, public acceptance, offshore wind energy

Introduction

Wind power has known an exponential growth in the past decade, reaching a level of 128751,4 MW installed capacities in the European Union in 2014 (EWEA, 2015). While this source of renewable energy produces no emissions to damage the environment and is widely available in many regions, the progress in the last years has produced various public attitudes in favour or against it, as wind farms have approached residential areas of inhabitants. Several studies have been performed in order to prove a general public reaction towards wind energy, which have resulted though in different reactions depending on the region of the location, phase of implementation and other characteristics of the wind parks. For example, Karydis (2013) mentioned opposed attitudes of the citizens against wind turbines in the planning stages of the wind energy project that decreased during the actual implementation phase of the project. However the author mentioned that the concern of damaging natural landscape through the expansion of wind energy projects has become significant in the mentality of people. Another study of Eurobarometer in 2011 showed 89% of the citizens in the EU demonstrated a positive attitude towards wind energy that was perceived with many benefits, among which creating jobs, supporting the minimal impact on climate change, contributing to energy security and economic wealth (EWEA, 2016). In their study of perceptions of wind turbines in a landscape as comparing to churches, pylons and power plants, Maehr et al. (2015) summarized the photographs of wind turbines that were presented to them as ''as more pleasant than but equally arousing as pylons; more pleasant and less arousing than power plants; and equally as pleasant and arousing as churches''. While there is a largely spread mentality, that the offshore location of wind parks contributes to their increased acceptance by the people, Jay (2008) and Wolsink (2010) affirmed otherwise, as there is interaction with other stakeholders, such as fishermen, tourism agencies and population close to the shore and also due to the interaction with marine life, that is causing disturbance to the natural balance.

The controversial opinions on wind energy continue to cause several debated among researchers and also wind energy companies that are struggling to find solutions and methods of increased public acceptance through the cooperation with citizens and other parties.

The objective of the present paper is to inquire public perceptions on the placement of wind turbines depending on their possible locations, as well as the methods wind energy companies should use to increase public acceptance and awareness towards wind energy considered by the respondents as efficient. Furthermore, the orientation of the participants towards financial support of the use of wind energy and their availability of investing in wind turbines on their property was also an aspect of interest for the research.

The main hypotheses of the study were:

H1: *Most citizens would support the construction of offshore wind turbines, as they do not interact with residential areas.*

H2: *Financial gains (such as shares or a yearly amount offered by wind energy companies to citizens) would be more effective methods than involving citizens in the planning of wind energy projects, including selection of wind turbines location.*

Literature review

The placement of wind turbines represents an important factor of the planning of wind turbines and wind parks as it should not interact significantly with human habitats and

neither damage visual landscape or environment quality in the regions where they are located. One classification of public attitudes can be done based on the phase of the wind energy project, such as the planning phase, construction phase and after the construction phase.

Braunholtz and Scotland's study (2003) emphasized that people already living close to wind turbines (20 km) found the landscape they lived in pleasant, while concerns were raised before the actual construction of the project, due to possible impact on landscape (27%), noise during construction (15%) and traffic during the same phase (19%). These concerns were mostly scattered after the project implementation phase, when only 12% of the respondents mentioned impact on landscape and fewer mentioned the other impacts. Furthermore, Karydis (2013) mentioned the positive attitude towards wind energy as long as it is not built close to their habitat, thus the ''not in my back yard'' effect. Wolsink (2010) underlines the similarity of public acceptance in the case of offshore and onshore wind parks, as the offshore environment is also an important landscape for the stakeholders, could be also a historical landscape in some cases and implies interaction with several parties, which could oppose the construction of wind turbines. Similarly to Jay (2008), Wolsink (2010) denied the idea of the offshore wind parks being more protected of public negative reactions than onshore wind parks.

Table 1. *Major causes of public reactions against the installment of wind turbines*

Construction phase impacts (acute noise, replacing soil with concrete, cutting trees)
Birds and bats fatalities
Shadow flickering
Visual landscape damage
Health issues (hearing loss, visual problems)
Affecting marine sealife (modifying routes of fish)-in case of offshore wind turbines
Affecting landscape of historical sites
Increased size of wind turbines in time
Electromagnetic interference

Source: Wolsink (2010), Hirsh and Sovaccol (2013).

Several reasons of opposing the placement of wind turbines have been identified by authors, as shown in Table 1, however the most debated reason was the issue of visual landscape damage, that could affect natural environments and people's habitat, where they are used not to have interfering technological installations, such as wind turbines (Hirsh and Sovaccol, 2013). Meanwhile, the threat for fauna and green regions of certain wind turbines locations that require cutting down trees and replacing natural soil with CO2 emissioning concrete is becoming more and more a reason of opposing wind turbines placement already as shown in Table 1. However, as Berndt (2015) shows, certain materials must be used to place wind turbines on, so as to diminish CO2 emissions, such as the ''use of 32 MPa class concrete (rather than 40 MPa), that can reduce the concrete generated emissions by at least 11%''. Regarding the methods used by wind energy companies to increase public acceptance to wind parks, Casey (2013) mentioned that business people from this sector have developed efficient and direct methods to cooperating with citizens, such as co-interesting citizens in their own company, educating citizens and considering their opinions through diverse way of involvement in planning projects or expressing their opinions on wind energy projects, building connection to local citizens and organisations to find solutions for the common well-being.

Methodology

The present study was based on the Delphi method with interviews and questionnaires that were offered to the participants in order to focus on the actual public perceptions of the participants. A sample of 64 Dutch citizens and 40 Romanian respondents agreed to participate in the research in order to identify the similarities and differences in public perceptions of wind turbines in the two cases.

In the case of the Romanian citizens 96% owned their own apartment, while only 6% rented or were still living with parents, in the case of students. Only 34% of the Dutch respondents owned their own apartment, while 66% rented or lived with the family or roommate. The occupation of the interviewed participants ranged from the research field to medicine, banking and financing, journalism, consultancy, translations and other fields. Most of the participating citizens had not been exposed directly to the wind energy field. 58% of the Romanian and Dutch respondents were below 35 years old.

The questionnaires were divided into two parts: the first part of the questionnaires offered in the first phase of the questioning referred to the orientation of citizens towards financially supporting renewable energy in their own energy consumption, as well as their reaction towards placing wind turbines close to archaeological sites, offshore or to investing in wind turbines on their own property. The second part of the study referred to the methods wind energy companies should use (in the opinion of the participants) to increase public acceptance and the intention to cover the own need of energy from renewable energy sources.

The research time span was between 1st June 2015-1st February 2016.

Findings and results

The participants were interviewed about several aspects of the wind turbines possible placement and methods of increasing public acceptance of wind energy projects, such as financial benefits, creating a direct connection to consumers through education in the direction of renewable energy or through promotions through strategic partnerships of the wind energy companies with other entities, such as other companies in the field, government, non-profit organisations in the field.

First the respondents were asked about their involvement in the wind energy field, in order to establish a direct orientation towards this renewable energy sector, as well as to the matter of supporting sustainable energy. The majority of the participants from both countries were not involved in any wind energy activity (98% of the participants in Romania and 87% of the participants from the Netherlands). Only 1 participant from Romania was involved in research in the wind energy field and 13% of the Dutch respondents, either owned shares in wind energy companies, worked in wind energy companies or did research in this field.

The second aspect referred to the availability of respondents towards paying more for sources of renewable energy such as wind energy in order to cover their own consumption. 63% of the Romanian citizens agreed to pay 25% more for renewable sources of energy to cover their energy needs, while 25% would not agree to pay anything additional for this type of energy. The rest agreed to pay either 50% or 100% more for renewable energy. The Dutch participants appeared more reluctant to spending more on renewable energy sources for their own consumption: 47% would not agree to pay more for green energy, 38% would pay 25% more, while 8% would pay 50% more and 4% would pay 100% more for clean energy to cover their energy consumption. The rest of the participants offered no answer or mentioned a maximum of 10% additional costs they agree to pay for renewable energy.

The third aspect covered by the study was the public reaction of the respondents regarding possible locations of the wind turbines.

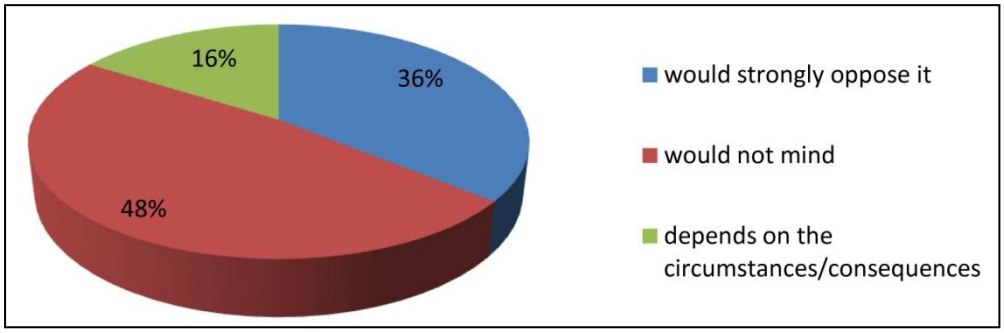

Figure 1. **Reactions of Dutch citizens on the statement ''How would you feel if a wind turbine would be constructed close to an archaeological site?''**

Source: Author's own research.

The questions referred to placing wind turbines close to archeological sites, offshore or on the own property of the citizens. When asked about the placement of wind turbines in the proximity of an archaeological site, the majority of the Dutch respondents mentioned they ''would not mind'', while 38% would oppose it, as shown in Figure 1. Half of the Romanian participants were against the concept of placing wind turbines close to archaeological sites, while 35% would not mind and the rest did not know yet what to answer.

The perspective of the participants' changed significantly, when they were asked about the placement of wind turbines offshore. As shown in Table 2, most of the participants from both countries would support it. Some mentioned during interviews this type of placement would not disturb the citizens' residential areas, while there could be more wind energy produced by the offshore wind turbines with a higher production capacity. On the other hand, 4% of the Romanian respondents and 12% of the Dutch respondents were cautious when offering an answer and considered it would depend on the consequences on the offshore environment, tourism and other possible negative consequences of such installations.

Table 2. *Perceptions on the placement of wind turbines in an offshore environment (according to the answers of the respondents)*

Romanian respondents (%)	Dutch respondents (%)	Perceptions
58%	69%	-would strongly support it
38%	19%	-would not mind
4%	-	-as long as it does not affect sea transport/tourism and/or sealife, they would support it
-	12%	-their answer would depend on the circumstances and/ or consequences of the wind turbines in the offshore environment

Source: Authors' own research.

Furthermore, when asked about investing in wind turbines on their own property in order to produce renewable energy, 45% of the Dutch respondents would be interested, while only 20% of the Romanian respondents would focus on such an

investment for the next years. 34% of the Dutch participants and 20% of the Romanian participants mentioned they would not be interested, while the majority of Romanian respondents (60%) did not know yet. The rest of the Dutch participants either did not know yet, did not own property on which wind turbines could be constructed or would only be interested in wind turbines on their property if they would get funded for the investment. The Dutch respondents mentioned the wind energy companies in the Netherlands often offer incentives for the acceptance of wind energy companies on citizens' properties, which produces more awareness of the public to the phenomena of wind energy projects across the country. Thus, the next aspect inquired were the possible methods of companies in the wind energy sector to increase acceptance of the citizens towards placing wind turbines in certain areas, and especially in the proximity of the residential areas. For both Romanian and Dutch citizens the financial gain of citizens were highly emphasized in their responses for the increased acceptance of wind turbines. As seen in Table 3, half of the Dutch respondents mentioned an yearly amount or shares offered by the wind energy company to citizens as the first efficient methods to increase public acceptance. Similarly, 68% of the Romanian respondents mentioned the yearly amount as a proper method for increasing citizens reactions to wind turbines and 43% mentioned shares within the wind energy company as an efficient instrument of firms in the sector. Almost all participants mentioned multiple methods they perceive as proper and/or efficient for wind energy companies to attract public to the wind energy projects.

Other important aspects wind energy companies should include in their initiatives of gaining citizens positive reactions and understanding towards cohabitating with wind turbines would be according to the respondents:

-ordering research to prove minimal effects of wind parks on environment and property value, stated by 38% of the Romanian participants and 17% of the Dutch citizens. Participants from both countries, which mentioned this method, affirmed their perception on the construction of wind turbines would depend on such research. The possibility of decreasing property value due to the visual impact, noise and other consequences of wind turbines was a main factor of acceptance decision for Dutch citizens, which mentioned the scarcity of land for placing wind parks in the Netherlands, as these projects are expanding yearly.

-involving citizens in the planning of the wind energy project, 30% of the Romanian participants and 47% of the Dutch participants.

-educating citizens about the necessity of using other forms of energy, namely renewable energy, was another method mentioned by 5% of the Romanian participants.

Table 3. *Methods of wind energy companies for increasing public acceptance of wind turbines (according to the answers of the Dutch respondents*

Percentage of respondents, who stated the method	Methods of increasing acceptance of wind turbines
50%	Wind energy companies offer yearly amount to citizens close to wind parks.
47%	Wind energy companies offer shares within own company to citizens.
47%	Wind energy company involves citizens in the planning of the wind energy project (including location selection).
17%	Wind energy company orders research to prove minimal effects of wind turbines on environment, visual landscape and property value.
19%	Wind energy companies endorses their projects through strategic partnerships (with government, other wind energy companies, etc.).

Source: Authors' own research.

The last question referred to the focus of the participants in the consumption of renewable energy for the next years. 64% of the Dutch citizens gave a positive answer, while 33% of the Romanian participants mentioned the same. 45% of the Romanian participants and 19% of the Dutch respondents did not know yet what to answer. Although, the Romanian wind energy market is still growing and has a large surface, that could be used for the placement of wind turbines without concerns of interacting with residential areas, Romanian participants offered cautious answers on their reaction towards wind turbine placement. While most of them would be interested to support wind energy and other renewable energy sources by paying more for this type of green energy, they were conscious about the possible consequences of wind turbines on the landscape and environment where they were placed.

Conclusion

As to summarize the results of the study the first hypothesis of the research was proved to be true in the case of the questioned participants, namely most citizens would support the construction of wind turbines offshore (58% of the Romanian respondents and 69% of the Dutch participants). The second hypothesis of the study was partly confirmed, as both financial benefits, such as shares and yearly amounts offered to citizens by wind energy companies were mentioned by half of the Dutch respondents in the same percentage as involving citizens in the wind energy companies planning of projects, including offering them the possibility to select a location for the wind park. In the case of the Romanian participants, the hypothesis was confirmed, as the financial gains of the public, such as shares or yearly amounts offered by the wind energy company were emphasized by more respondents than the involvement of citizens in projects' planning.

The issue of public reactions towards wind turbines has grown in significance in the past decade as the wind parks have extended, especially in the western part of the European Union and are expected to be a permanent part of the landscape in the next years. The possibility of cooperation between wind energy companies, government, other partners and citizens represents thus, today a major point of debate in order to find solutions for increased acceptance of the public for the new landscape in which they will be located. While in the Netherlands and other European countries, wind energy companies already cooperate with citizens through their involvement in the own business through shares or through the population's direct involvement in the planning of wind energy projects, the issue of threatened natural landscapes by the presence of wind turbines is still causing displeased citizens and organisations. These counterparties of the construction of wind parks often do not find these types of incentives sufficient to mend the produced damages to human and environmental well-being and represent a major concern for wind energy companies, exposed to the risk of stopping ongoing or planned projects due to population protests.

Thus, the future objectives of the current research will be the observation and analysis of public perceptions of the population towards wind turbines in different countries of the European Union and the analysis of the developing methods of wind energy companies to gain citizens acceptance of their wind parks projects, a certain part of the sustainable future worldwide.

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Section B: Business Sustainability

The impact of Sustainable Human Resource Management from a Romanian perspective

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Abstract. *Sustainability in general has attracted more attention in the last two decades, as the key to our future lies in the strategies to balance between profit, people and planet. Up to this point the studies referring to sustainability in HRM have been scarce, especially with regard to Romanian Companies. In the light of these events, based on De Prins Sustainable HRM (SHRM) model, a quantitative study is proposed to address the following issues: (1) the extent to which the HR department is concerned and contributes to the company's sustainability and (2) the extent to which HR managers of large Romanian Companies associate specific policies to Sustainable HRM. Seeking to fill a gap in the SHRM literature our findings will: (1) reveal the activities behind Romania's SHRM, (2) provide an empirical foundation for further theory development and research on SHRM in Romania's companies and (3) based on the revision made, no study has established based on De Prins model, the embedment degree of sustainability principles in HRM, especially in Romanian Companies. We conclude that identifying and considering the effects of sustainability on HRM may enable HR Managers, companies and their employees to create Sustainable Corporations.*

Keywords: corporate sustainability, human resource development, historical analysis, Romanian multinational companies, hypothesis testing; organizational change, drivers for sustainability.

Introduction

Ever since the existance of individuals on Earth one thing was certain: the subject of change as being an exponent of adaptation to the existing environmental conditions (nature & social) in a continuous transformation. To some extend the world was used to, and in some limits it is still used to judge things in a „cartesian" and sometimes absolute mode such as: good-bad, more - less, big-small, far-close, hard-slowly. In time, people realized the importance that lies between these "extremes", the shades, the perceptions and understand how to reach from point A to point B. This rapid change regarding society and organizational needs led to different ideas and perceptions of how a company should pursue its goal and how to obtain organizational effectiveness.

In the past century the globalization and continuous technological progress generated an increase in competitive demands causing severe changes across and within companies world-wide, affecting and transforming not only the HRM strategy, but also their decision-making processes. In order for an organization to function properly the crucial resource is represented by "people". The purpose of HRM is to manage the work-relationships in a way that satisfies both individual and organizational expectations (Arnold 2005).

If other elements can be defined as "limited" (natural, financial, etc.) regarding the knowledge, intelligence and innovation as basic enshrined of humans – HR, we could say that everything depends on one's almost unlimited imagination, vision and ingenuity. Eventually our abitily to adapt to this continous transformation can be summed up under one concept: sustainability. HR represents the resource without which nothing could exist, stimulated by thee way we think, act and do the things on our planet. As the Greek philosopher Protagoras said: "The man is the measure of all things"

Literature Review

According to Van Eijnatten (2000) HRM has become responsible dealing with changes and deciding what goals ought to be pursued. Authors such as Ulrich, Losey and Meisinger (2005) have agreed that all these changes will have a positive impact on Human Resources (HR), in others words bringing it to light. Ehnert (2009) declares such intense changes in trends bring out the need for better strategies and practices in HRM overall defined as Sustainable HRM. Sustainability in general has attracted more attention in the last two decades and Wilkinson (2005) refers to it as a "hot topic" in the field of management research. Nonetheless, up to this point, the studies referring to sustainability in HRM have been scarce and few links between "sustainable development", "corporate sustainability", "corporate social responsibility" and HRM have been shaped (Zaugg et al., 2001; Ehnert, 2006; Zoogah, 2011; Aggerholm et al., 2011). In 2002, Dyllick and Hickerts defined "corporate sustainability" as the sustainability transferred to the business levels – concentrating on the effect of the business upon the environment, while "corporate social responsibility" considers the social dimension as well. There are many debates as to the exact definitions of these terms (over 200 different versions) but for our focus we define Sustainable Development in the same way as Corporate Sustainability: *A development that meets the needs of the present without disrupting the capacity of future generations to reach their own needs* (Wempe and Kaptein, 2002). Sustainability theories explain the need to balance the social, economic and environmental factors according to the World Summit on Social Development (2005). According to Wempe and Kaptein (2002) definition, Corporate Sustainability can be realized if an organization takes into consideration the

effect of the financial profits and balance it between the stakeholder's wishes and environmental impact, in other words *profit, people and planet.*

These observations have led us to reanalyze the HRM concept at its widest form and examine whether or not this association between HR and Corporate Sustainability is brought up to light. This study has its starting point the Harvard School map of the HRM Territory (Figure 1). This map of HRM territory demonstrates how important are the connections between external/ internal environment of the organization and HRM, but also how easily their policies can be influenced and have immediate as well as long term repercussions upon the organization. A short analysis of this model brings in attention aspects that are directly or indirectly associated with the concept of Corporate Sustainability.

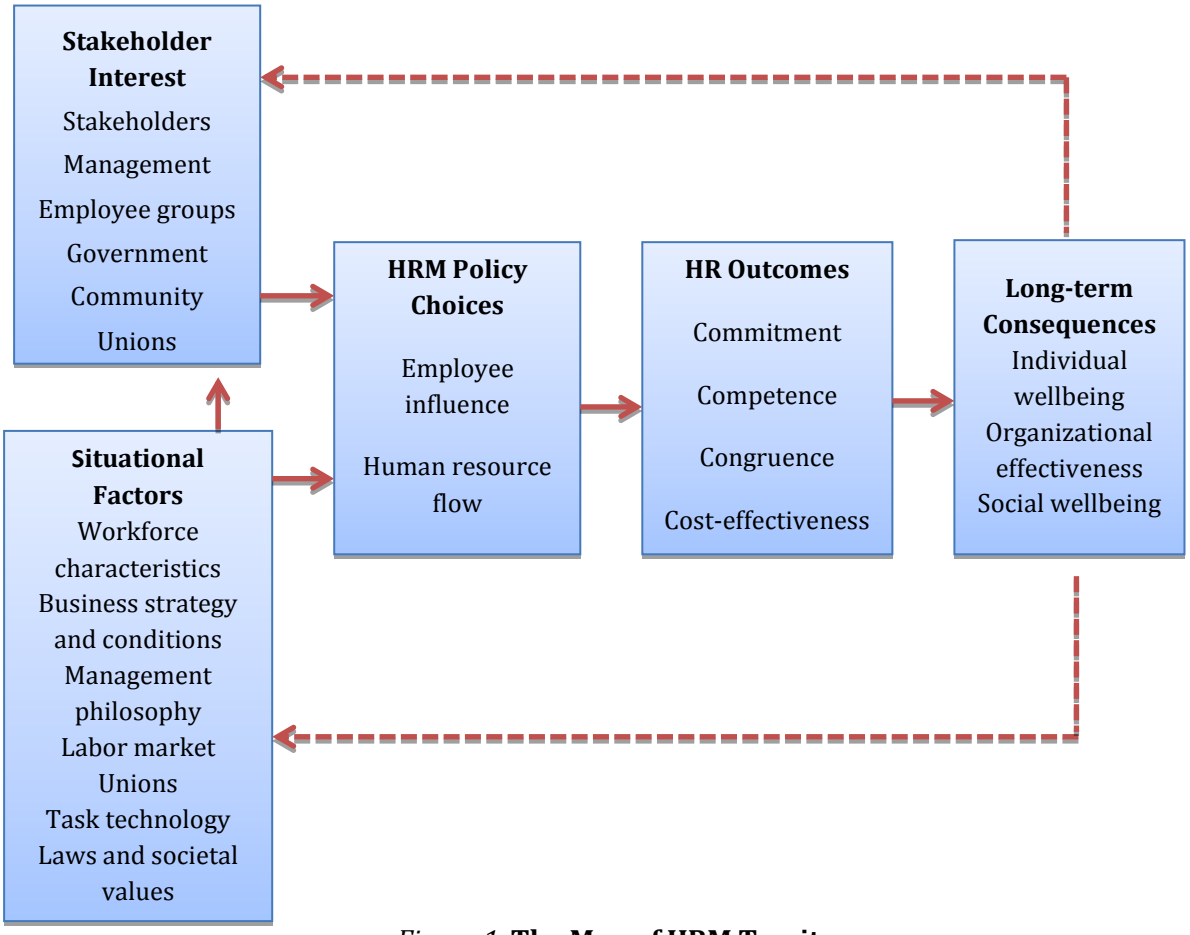

Figure 1. **The Map of HRM Territory**
Source: Adapted- Original model Beer et al "Harvard Map of HRM Territory" (1984).

After a profound exploration of the extant literature several aspects were linked with Sustainable Human Resource Management. In order to maximize the performance of employees, HR departments undertake a series of activities such as: job design and analysis, workforce planning, employee's attraction recruitment and selection, training and development, performance management, compensation and management of legal issues. According to Ehnert (2009), Cohen (2010) and De Prins (2011) human resources could take into consideration the concept of sustainability and incorporate it within the organizational management and achieve Corporate Sustainability. The first authors who approached the topic of Sustainable HRM were Zaugg et al. in 2001 focusing on the

economic aspect (the supply of qualified employees) and social aspect (how the organizations treat their employees) while suspending the environmental concerns. Still their findings concerning the link between sustainability and HRM practices were discrepant. Other authors (Kellerman, 2010; Zoogah, 2011; Aggerholm et al., 2011) take into account the environmental aspect of sustainability concentrating on HRM contribution and involvement in Corporate Sustainability.

One of the most interesting ways to capture the complexity of this concept of Sustainable Human Resource Management (SHRM) is De Prins's holistic model consisting of four approaches to Sustainable HRM. The author argues Sustainable HRM focuses on using and respecting in an optimal manner the human workforces within the company through which an explicit relationship is constructed between the company's strategic policies and its environment (Figure 2). There are four approaches of the concept of sustainable HRM - a sociological, psychological, strategic and green approach, out of which the first, the second and the fourth are exhibited in concrete policies.

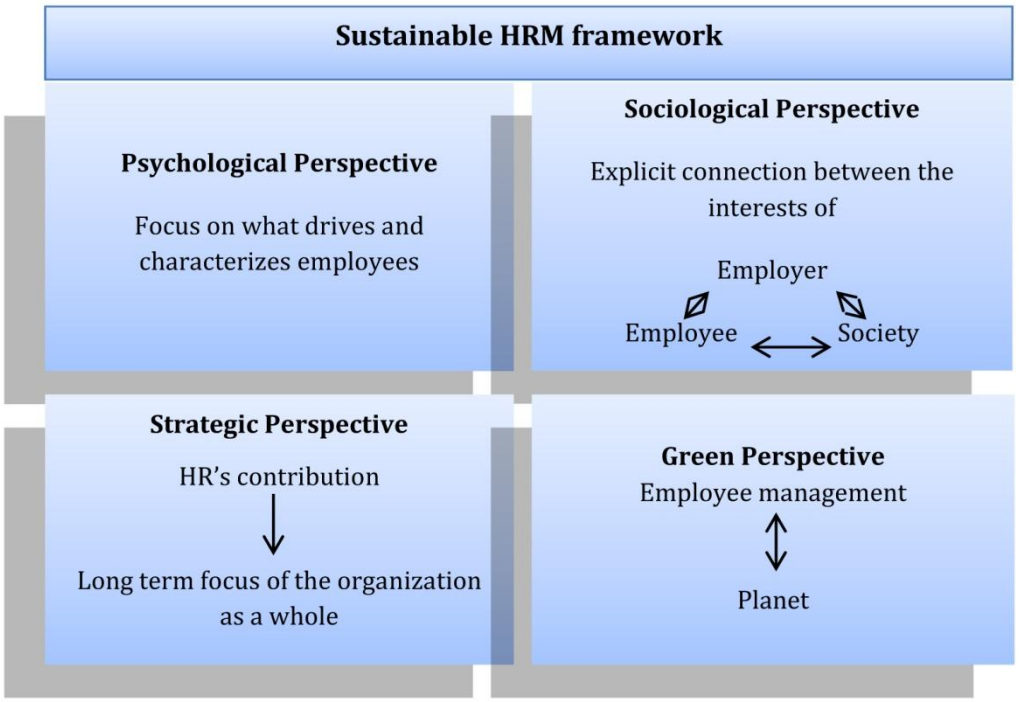

Figure 2. **De Prins Holistic Model**

Source: Adapted- Original model De Prins (2011).

The *sociological approach* aims at "socializing" the practices of HRM by connecting the interests of employer, employee and society. Its focus is merely on engagement policies, health policies and societal themes such as: diversity, volunteer-work, employee's physical health and catering health. In terms of diversity certain features are based on: personality (traits, skills), internal (gender, race, I.Q.), external (culture, nationality, religion) and organizational (position, department). These characteristics are linked directly with the management practices inside any organi-zation. That is why managing the diversity of their individual abilities, competences and qualifications becomes an important factor in a successful HRM, an understanding of how organizations function and how to manage HR in a sustainable way.

The *psychological approach* is in charge of employees "soul" by focusing on aspects such as: work-life balance, autonomy, self-development, employability and

dialogue. Work life balance means creating and maintaining a good, supportive and healthy work-environment. This balance could be influenced by: long working hours, job security, overload work-demands, the lack of support from supervisions and coworkers, extensive use of communication technology etc. Today's workers may also have other competing responsibilities like children, household, volunteer-work, spouses and elderly parents that contribute highly to the individual's stress. That is why employers are becoming more aware of the cost implications associated with over-worked employees: lack of commitment, punctuality etc. As a result to employee needs a lot of companies developed programs to help them reduce the stress: gym membership, wellness programs, healthy eating habits, counseling, therapists, and longer vacation times as part of the benefits package or by allowing job-sharing or flexible scheduling. However if not done properly this could compromise the entire organization.

The *strategic HRM approach* is the third perspective that asks how Sustainable HRM is related to Strategic HRM with focus on how Sustainable HRM impacts on typical HR domains such as: intake, employee turnover, appraisal and employability (organization as a whole). In the strategic HRM literature, the main focus falls on the resources of the company as a means to explain how people as the HR component can provide a sustained competitive advantage. Also HRM could contribute by establishing suitable practices to create and develop this high-quality workforce. Even though competitive advantage refers to inimitable practices, HRM does not fall into this region for each company is unique and each HRM practice reflect the firm's specific and particular circumstances.

The last approach is called *green HRM* and it is in charge of establishing which aspects of HRM can turn the organization "green". It is focusing on green behavior as a competence, trainings in sustainability awareness, stimulating environmentally conscious behaviors and green employer branding. An employee perception towards a company's reputation is the one that influence his desire to pursue employment or not with that company. Thus Sustainable HRM intervenes by providing and securing long-term supply and "reproduction" of their human resources and creating employer attractiveness.

Purpose and research objectives

This paper challenges a research to establish the role of HRM in consolidating Corporate Sustainability in Romanian Companies. Destined to the HR managers and directors from the selected number of companies, operating in Romania, the study aims to evaluate and discuss the role of HR in creating a sustainable company. Our study starts from the highest weight in GDP and selection of main companies, of top in Romania, in order to analyze their HR component with focus on sustainability. Our interest is to discover if their model can be applied to other companies, with lower contribution in GDP and increase their organizational activities at all levels: financial, social and environmental. The obtained data will be classified demographically with regard for the type of company (Romanian subsidary of a multinational company, local or others), accoding to the industry our respondents came from (oil and gas, tabacoo, automobile, telecommunication, banking) according to the respondents position (HR Dirrector, HR Manager, HR Coordinator or others) and according to the size of the company (0-49 employees, 50-99, 100-149, 250-500 or >500). Choosing an organizational diagnosis model for HR sustainability is justified by the decreased number of elaborated studies that focuses on this theme on sustainability of a job or within a company. According to this research paradigm we start from the assumption that the HR departments have important adaptive functions essential for the evolution of a company from an

organizational as well as sustainable point of view. As distinctive elements these processes/ functions defined by a set of evaluation scenarios universally accepted which are: selection and employee's engagement, training and leadership development, career development, retention and benefits, performance and change management. Considering the responsibilities of HR professionals are linked to organizational processes, to the management of change and to the culture of the organisation HR must play a key role in the development, integration and implementation of the sustainability strategy. The above fundamental theories once sinthetised will be used to construct an explanatory model as an answer to developent and to promote sustaninability and its development within the HR department. During our research we will follow-up the degree of sustainability for each company by constructing an industrial graphic with the extent if sustainability of each company that activates in the Romanian environment.

General objectives of research

The first objective of this research concerns an analysis regarding the HR managers' perception towards the role of the HR functions in developing and advancing sustainability inside the company.

The second objective of this research aims to measure the level of adoption by HR departments of certain actions or HR measures from the field of sustainability.

The third objective of this research is identifying barriers that prevent HR from having a strategic role in the company's initiatives towards sustainability.

The specific objectives corresponding to each of the above are detailed in ne next chapter of the paper along with the discussions and conclusions on specific matters. The research will take place over one year and will include a preliminary period of construction and verification of the selected model. It will also provide an insight into how Sustainability is integrated into HR practices in Romania.

Case study

Sampling method

In order to establish the sample for the study we propose to inspect various business sectors and select, for the purpose of this investigation, only the branches that contribute the most to the Gross Domestic Product (GDP) of this country. More explicitly, we consult the National Institute of Statistic (NIS) database, the Institute for Economic Forecasting, the Comparative Economic Institute, the National Agency for Fiscal Administration (ANAF), Government reports and Economic Journals. To narrow down our selection we nominate the top 5-biggest sectors that contribute to Romania's GDP. Ergo we come up with the following: *the Oil and gas industry, the Tabaco industry, the Automobile industry, the industry of Telecommunication and on the fifth place the Banking sector*. Figure 3 represents a percentage display of these sectors and the proportion of their contribution in Romania's GDP.

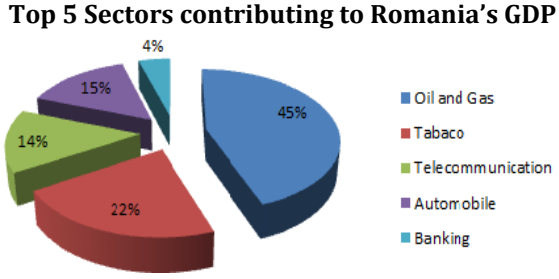

Figure 3. **Percentage display of top 5 industrial sectors in Romania**
Source: Adapted- Based on INS, Economic Reports and Journals database.

In addition, for each of the areas we will nominate the Romanian market leaders from each branch of activity where we will focus our concerns. This helps to diagnose power concerns, so that we can distinguish between company and industry level effects. According to Minister of Finance we discover that five companies in the oil sector and three subsidiaries of international cigars manufactures dominate the ranking in the largest payers of taxes to the budget in Romania, and along with Romanian Central Bank and Romgaz paid in 2014 around 29, 7 billion lei or 15% of the total revenues of the consolidated general budget (Table 1).

Table 1: *Top 14 largest Romanian Contributors*

Contributors	Industry	Residence	Paid amounts to the state budget	Contribution in % to GDP
1. OMV Petrom	Oil and gas	Bucharest	8 Billion	3, 6%
2. BAT Trading	Tabaco	Bucharest	5, 6 billion	3, 3 %
3. Rompetrol Refinery	Oil and gas	Constanta	4, 6 billion	3, 1 %
4. Orange Romania	Telecommunication	Bucharest	4, 4 billion	2, 2 %
5. Renault Romania-Dacia	Automobile	Arges	3, 3 billion	3 %
6. Vodafone Romania	Telecommunication	Bucharest	3, 2 billion	1, 2 %
7. Petrotel-Lukoil	Oil and gas	Prahova	2, 2 billion	1,1 %
8. Phillip Morris Trading	Tabaco	Ilfov	1, 9 billion	1, 1%
9. Lukoil Romania	Oil and gas	Bucharest	1, 55 billion	1, 1%
10. Romanian Central Bank	Banking	Bucharest	1, 51 billion	1, 1%
11. Romgaz	Oil and gas	Sibiu	1, 49 billion	1, 1%
12. JTI Manufacturing	Tabaco	Bucharest	1, 3 billion	1 %
13. MOL Romania	Oil and gas	Cluj	1, 25 billion	1 %
14. Ford	Automobile	Craiova	~1 billion	0,7 %

Source: Ministry of Finance.

Romgaz and Romanian Central Bank are the only Romanian entities who appear in the top 10 contributors to the national budget. According to the Minister of Finance the Romania Automobile industry provides 11% of the GDP ~ 16 billion from which 5, 2 billion are given by Renault- Dacia (fifth place) and Ford (last place), while the rest of 10, 7 billion come from their providers. Therefore we will have a total of fourteen companies selected from five areas of industry as it follows: six companies from the oil and gas industry, three companies form the Tabaco industry, two from automobile industry, 2 from telecommunication and one from banking sector.

Quantitative research

We propose to conduct a study quantitative in nature using primary and secondary data. Hence in the light of De Prins Sustainability framework and on HR processes we choose a questionnaire, as a tool for measurement and assessment of sustainability for the selected companies. First we analyzed the extant literature, made a draft comprising all the ideas and improved further. In this matter we organized a focus group to discuss and establish the suitable questions for this topic of research. A mini-focus group was established involving the following members: Alecxandrina Deaconu - Phd in Economy,

Specialist and Prof in HRM, Marinas Cristian-Prof. in HRM, Claudia Ciocirlan-HRM Specialist, Popescu Mihaela-PhD in Management, Vladescu Angela-PhD student. A total of three meetings starting early November were established, among which different problems have arisen and several drafts were made. During our first meeting we discussed the questions for our first objective and established a suitable set of questions. By our second meeting we improved our questionnaire by adding the section concerning our second objective. For out final objective required one meeting and small changes have been made concerning the segmentation of the questions, the enunciation and the measurement scale (from a 6 point to a 5 point Likert Scale). We encountered problems with the written structure of the questions (clearly enounced, simple phrase, with no room for interpretations), with the structure itself (include all important subjects of each topic for valid model) and with the box asking the respondents for personal data (design an un-offensive and safe structure).

Data collection

To answer our *first objective, the perception of HR managers from Romanian companies towards HR role in sustainability*, we will analyze each role (Table 2) HR may have in creating a sustainable company. The respondents perception (answers) will be measured on a Likert Scale measuring from 1 to 5 as it follows: 1-Total Disagree, 2-Disagree, 3-Agree, 4-Totally Agree, 5-Not agree nor disagree. The Managers will be asked to encircle only one answer, the one that comes closer to their belief.

Table 2. *Roles of HR Managers*

1. The importance of integrating the sustainability in the organizational behavior.
2. The importance in facilitating communication between employees on improving the sustainability performance of the company.
3. The contribution in creating an organizational culture that supports sustainability.
4. The integration of sustainability in leadership training program inside the company.
5. The responsibility for integrating sustainability in core HR processes.
6. The importance in obtaining the staff support and management for sustainability.
7. The involvement in creating strategic sustainability programs.
8. The involvement in change management activities that contribute to the basic principles and the adoption of sustainability initiatives inside the company.

Source: Authors' own research.

To answer our *second research objective, measuring the level of sustainability the HR adopted in a company* we will take the main HR areas of action (Selecting and Engaging employees, Training and Leadership development, Career development, Management of Performance, Change Management, Retention and Benefits) and apply a number of questions per each category. The respondents will be asked to encircle one response that will be measured on a Likert Scale of 1-5 as it follows: 1- Not applicable 2-Its adoption is not intended, 3-It is considered, 4-It will be adopted in the next 12 months, 5-Already applicable.

A. In order to evaluate the actions and measures implemented by the HR department in terms of sustainability - *Selecting and Engaging employees*, we will have 9 actions to evaluate. First we will focus on: creating job descriptions which emphasis on

knowledge and skills related to sustainability, evaluating candidates based on the competencies that contribute to sustainability and motivation to solve social or environmental issues relevant to the company, the possibility to discuss sustainability topics in interviews and the inclusion of information regarding commitment and sustainability objectives into the company's induction program. Also sustainability should be integrated into strategies for involving employees. To this end we identify the following actions: creating evaluation questionnaires for employees on topics related to sustainability, creating the so called "Green Team" to coordinate implementation and awareness of environmental actions.

B. For *Training and Leadership development*, we will focus on 2 actions. By attending at training sustainability sessions, the employees may have a better understanding of the company objectives and values towards sustainability and also feel motivated to pursue them. Sustainability trainings may address general subjects (ex: understand and reduce the social and environmental impact of the company) or develop specific abilities (ex: measurement and reduction of the company water footprint, biodiversity and natural resources conservation in the company's operation area). Also, the HR has an important role in creating programs designed to promote sustainability as a way of thinking and acting inside company that will contribute to create sustainability leaders in the organization.

C. For *Career development*, we enounce one action, concerning the sustainability inclusion in the company's career development routes. We consider an approach to be sustainable, in terms of career development, when the company supports its employees in choosing career paths and development projects related to sustainability. A method of encouragement in choosing a career based on sustainability lies in employee engagement in strategic volunteer programs or sustainability initiatives.

D. For *Management of Performance* section, we will ask if employee's performance is measured also on the side of sustainability through the performance evaluation system or not.. One way to measure this progress is by including in the performance evaluation system certain indicators to measure employees' contribution in achieving sustainability.

E. For the *Change Management* section, we will focus on 2 actions. In order to develop sustainable business practices, the HR department has the lead role in implementing change management activities that will help the company to make progress on the sustainability part. One way that companies can create change for sustainability is by developing platforms and tools to spread ideas and information related to improving social and environmental performance. Another way to encourage change for sustainability can be done by identifying and promoting internal sustainability champions, initiatives ambassadors designed to transform the business into a more responsible one.

F. In our last section, *Retention and Benefits,* we will focus upon 2 actions. We believe that when creating a sustainable company, HR must ensure the sustainability objectives of the company are reflected in the employees compensation programs (ex. for financial performance, social performance and environmental). Also HR must develop strategies that lead to motivating and retaining employees with high performance regarding management and mitigation of social and environmental impact

of the company. Various incentives will be considered: parking for bikes, cars, gym memberships, etc.

To answer *our third research objective, the barriers that prevent HRM in having a strategic role in company's sustainable initiatives,* we will present our respondents with an open question. We will ask the HR managers to answer openly and without fear and tell us the biggest barriers, in their opinion, that prevent HR department getting involved in the company's sustainability strategy.

Desired Results

All responses will be processed and interpreted using SPSS statistical data analysis. Based on the obtained results we can create graphical representation of each objective. Results obtained from our first and second objective could be represented on a color chart. Based on our open question regarding the "biggest barriers that prevent HR's involvement in sustainability" possible results may reveal: the lack of interest and support from management; Rreluctance of people in the company; Ssustainability may not be considered a priority in the company, or HR may not be seen as a function for implementing sustainability strategy;

Possible recommendations

Based on the results of our study "*The Impact of Sustainable Human Resource Management from a Romanian perspective*" and international research in the field, we desire to create a set of recommendations adapted to Romanian context. The recommendations will be targeting, in particular, representatives of HR in management or coordination positions. Examples of recommendations:

- Awareness of role that HR representatives have in creating a sustainable company;
- Involvement of HR in developing and implementing sustainability strategy (employees etc.);
- Developing education and commitment programs, for employees, on sustainability;
- Developing tools through which to information and ideas about sustainable development of the company can be disseminated.

Future studies

For further studies we desire to create a correlation analysis, using correlation coefficients, to discover whether or not we find any association between our variables. We may show if our respondents' answers are consistent with the industry they come from or the place they occupy in the company. This research may represent a good foundation for further studies, with a better focus on a certain industry or type of company, in terms of sustainability. Further analysis, with a much better focus may show us if the results can be applied to the overall population.

Conclusions

The study is exploratory at nature and aims to investigate in Romania this relatively new subject for our business sector, offering an overview of how sustainability is and can be integrated into HR practices. It will be based on the complete answers of HR

representatives situated at management or coordination levels within national or multinational companies activating in different industrial fields in Romania. The data concerning: the respondents' level of responsibility as well as the size of the company they belong to and the industry source will represent a starting point for initiating further studies with a more „exact" focus.

The benefits of this type of study are: *methodological*: building and validating the perception inventories, adopting measures and identify HR barriers in relation to a company's sustainability; *theoretical*: building theoretical – explanatory models based on the answers regarding the role of HR in Romanian companies; *applicative based*: providing concrete information regarding the HR Managers in Romania perceptions of their roles in the company's sustainability; explaining the methods that can be applied by HR managers for a successfull implementation of a sustainable strategy in the company; oferring examples of planning and actions methods for implementing a sustainable strategy in the company by HR Managers in order to shape a better image of sustainability implications.

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KAIZEN™ Management System (KMS): the driving engine of companies' sustainability

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Abstract. *In the times when every company is searching for an optimum way of achieving its mission and vision, the strategic management and motivation are representing some important pillars in the quest of achieving the continuous improvement performance. In the evolution from the traditional way of doing business, the industries and markets developed the need for an innovative and sustainable management system, which to achieve a competitive advantage, by increasing the profitability, productivity and by waste elimination. Having as meaning, "KAI=Change" and "ZEN=For the Better", the KAIZEN™ Management System (KMS) meets in an harmonious way the needs stated above, facilitating the evolution of organizations based on continuous improvement performance. By using various specific techniques and methods, the KAIZEN™ Culture has the opportunity of being nurtured each and every day by every person, in any environment. Striving for the continuous development of people as key parts of the organizations, being essentially responsible for the well-being of the society as a whole, the intrinsic motivation can be achieved also with KAIZEN™, with the help of Individual KAIZEN™ instrument. In this way, each employee is evaluating himself in the actual situation and identifies his improvement potential (every day becoming better than in the previous one), in order to reach his development goals within his individual and social evolution, and in relationship with the mission and vision of the organization, reaching harmony. This paper has the purpose of presenting best practices and guidelines from various industries, validating the applicability and sustainability of the KAIZEN™ Management System (KMS) in different fields and companies.*

Keywords: KMS, continuous improvement performance, Individual KAIZEN™, harmony motivation.

Introduction

In this globalized economy, the businesses from all around the world have become volatile, founding themselves in the continuous quest of obtaining and increasing their activity on the market. More than ever before, the sustainability in business represents a key pillar which should be properly designed by the management level. The classic paradigm of raising prices for achieving profit is not applicable anymore, due to the increase in the level of international competitiveness amongst companies. In order to be attractive and for obtaining the competitive advantage, the firms must meet their clients' needs, which are always increasing, keep up with their expectations and also offering them loyalty bonuses (such as discounts, premiums and so on). But how one should do that and in order also to maintain the profitability and position on the market? The answer to this question is represented by the KAIZEN™ Management System (KMS). Started from one of the most important companies in the world, Toyota (Toyota Production System), KAIZEN™ is having as key principle the continuous improvement, its dynamic approach leading to obtaining of the profit by reducing the costs of production, using several general and specific techniques and tools.

KAIZEN™ Management System (KMS) is applied at the present moment all around the globe, managing in a harmonious way to involve all the company levels towards the evolution and continuous improvement.

In Romania, there are also companies which are applying their own personalized way of the KAIZEN™ Management System (KMS). At the basis of training and collaboration, Kaizen Institute Romania is providing the companies with specific knowledge and know-how for applying different techniques in an optimum way, establishing a fundamental framework for inside self - instructing and continuous improvement. In what it concerns also the educational and training methods, at the global level, the companies are developing the KAIZEN™ Lean Academy, as an alternative for in-house KAIZEN™ development and for enhancing the appropriate required technical skills and competences.

Literature review

Studying the effects of various forms of trainings developed in different companies, Higuchi et. al (2015) conducted a research in two industrial clusters in Hanoi, Vietnam on small and medium enterprises (SMEs) for a period of three years, in the quest of assessing the long-term influence of the KAIZEN™ sustained impacts regarding training. Although the KAIZEN™ Management System (KMS) was used by numerous large companies from the zones taken into consideration, the SMEs from the research were practically introduced for the first time with the KAIZEN™ concepts and techniques. Developing an econometrical analysis, their results managed to provide some impressive results, from three perspectives: the first one was validating the sustainability of the improved management practices, the KAIZEN™ training program having favorable and lasting effects on the production management of the companies trained for at least two years in both clusters; the second considerable impact consisted in reducing the stocks and in improving the performance of the companies; the last, but not least finding represented the increase in the willingness to pay for such types of courses and trainings. While initially the trainings were provided for free, for research purposes, the impact on the knowledge acquired and its influence on the potential benefits, led to a demand for training from all the management levels of the companies.

In Malaysia, Maarof and Mahmud (2015) provided an insight of the successful and challenging factors of KAIZEN™ implementation. While it is customary to affirm that

that the SME sector provides the most important benefits in Malaysia in terms of employment and job opportunities with an average of over 55% of the job opportunities, the benefits of implementing KAIZEN™ are there to be considered. In this concern, the authors conducted a research having the objective of identifying the best existing practices for an optimum implementation. Their first important success step was found to be the good improvement of suggestion systems. Therefore, based on the experience and the day to day activity of employees, this tool provides motivation and encourages the involvement of every person (Womach et. al, 2007). The second factor of success is considered to be the management commitment, by establishing the strategy, directions of implementation, objectives and by supporting all the employees and management levels (Imai, 1986). The presence of KAIZEN™ champions and the effective communication represent also some essential contributing factors for a good implementation. Bateman (2003) describes a KAIZEN™ champion as an agent of change, having the appropriate knowledge in conducting KAIZEN™. The organization structure was found to be another important factor for achieving success, teams such as quality circles or cross functional working groups becoming catalysts towards the KAIZEN™ implementation (Marin-Garcia et. al, 2008). As main challenges in implementing KAIZEN™, resistance to change was found to be most frequent (Garcia-Sabater et al., 2011). The absence of compensations or reward for the employees, as well as the lack of proper training are considered to be also some influential factors of challenge for the implementation (Robinson and Schroeder, 2004).

Sutari (2015) introduces the use of KAIZEN™ in the energetic and industrial sector from India in order to improve the manufacturing of wind turbine components. Made out of Glass Fiber Reinforced Plastic (GFRP), the main objectives projected were the improvement of the manufacturing throughput time and the decrease of the rework/manufacturing costs. From the data gathering, it was observed that 75% of the defects are found in the nacelle product. For solving those specific problems, KAIZEN™ techniques such as Pareto charts, Ishikawa diagrams and action plans were used. Both objectives managed to be achieved, the manufacturing throughput time being reduced with 18,45%, while by reducing all the costs, a significant amount of monetary units was saved at every set of products.

The programs of education and trainings in KAIZEN™ have many different applications. Topuz and Arasan (2013) are presenting one such example, which facilitates the personal development desire, named Kaizen Educational (Kaizen-Ed). The Pilot Group ran with three groups of 8-12 students from the Faith University, Faculty of Education from Turkey. The persons constituting this group are applying several techniques of Individual KAIZEN™, scheduled in knowledge, comprehension, application, analysis, synthesis and evaluation domain sessions. The specific use of every of this sessions consists in progressive applications for gaining awareness on the KAIZEN™ techniques for development, personal knowledge, leadership development and managing different kinds of real-life situations. The feedback was encouraging for future extension and implementation of these types of educational programs.

Best practices of KAIZEN Management System (KMS)

As previously stated in the abstract, the paper has the purpose of presenting best practices of applying the KAIZEN™ Management System (KMS) in different fields of activity, which will be done in the following section.

Sustainability in the energy field: 5S, Muda Identification and TFM application in Hidroelectrica S.A.

Going on the continuous improvement way, one of the most important companies from the energy field, Hidroelectrica S.A. is a state-owned company which is providing services and power generation by using the hydropower resources in Romania. The company represents an example of a learning organization, collaborating with Kaizen Institute Romania for applying different methods and techniques for improving its performance. The company started with KAIZEN™ Foundation's courses, by implementing 5S (Figure 1) and Problem Identification, reaching after a while to some more complex methods such as TFM (Total Flow Management). As in any successful company, the management commitment and the involvement of every employee joined together in a harmonious way, in order for making the continuous improvement possible.

The pilot project started with a 3S Workshop applied in the Refurbishment Offices Area, the achievement of the 4th and 5th Ses representing the next steps for the following sessions.

Figure 1. **The 5S Method**
Source: 5S Workshop Hidroelectrica Report.

After a training session, followed by a visit in Gemba (the real place, where the value is added), the team established the following objectives:

- Identification of at least 40 problems;
- Solving minimum 80% of the problems identified;
- Creating Visual Management;
- Optimization of the workplace;
- Efficient organization of the documents;
- Eliminating useless objects;
- Labeling and systematizing documents;
- Creation of cleaning and systematization standards;
- Identification of all the necessary documents in less than 2 minutes.

All the steps required for proceedings of a well-developed 3S Workshop were realized. After identifying the problems and using the red labels for making them visual, the project team systemized the documents on specific categories and eliminated all the unnecessary materials using a "quarantine" zone. The next steps consisted in cleaning

the area, designing standards which to be visible and easy to understand, in order for every person who is working here to see how it should look like at any time during a day. A design of a schedule for further stages of implementation has been also defined.

By Identifying 57 problems (11 for S1, 43 for S2 and 3 for S3) and solving a percentage of 94.73% of them (2 more complex problems from S2 and 1 for S3 having still the red label for not being able to solve it on the spot), the objectives of the team have been achieved. The process of optimization and continuous improvement have been realized with the help of a PCDA (Plan-Check-Do-Act) cycle panel, where the methodology, steps of implementation, the contribution and results of the team and the grounds for further stages are developed (Figure 2).

Figure 2. **The PDCA Panel**
Source: 5S Workshop Hidroelectrica Report.

Going further in the continuous improvement process, the company used a method from the Total Flow Management (TFM), named Value Stream Design (VSD). VSD is mapping all the necessary processes and operations performed for a specific product or service from its start until the exit from the production line in terms of Quality, Cost and Delivery Time (QCD). If the case, four more indicators can be added, such as Motivation, Technology, Environment and Safety (QCDMTES). After the mapping of the initial state (Value Stream Mapping), the Muda identification analysis is done ("Muda" represents the Japanese term for "Waste) in order for the future state (the vision) to be designed in an optimum way (Value Stream Design).

Hidroelectrica performed a VSD workshop for the "Supplying" Department, having as main objectives to reduce the processing time with over 50%, the decreasing number of operations and of the corresponding operating times, the improvement of

Lead Time (the amount of time necessary from the order until the delivery) and of the employees' motivation. At the analysis of the initial state, the company found a lead time of 307 hours and 20 minutes, composed by 21 operations (Figure 3).

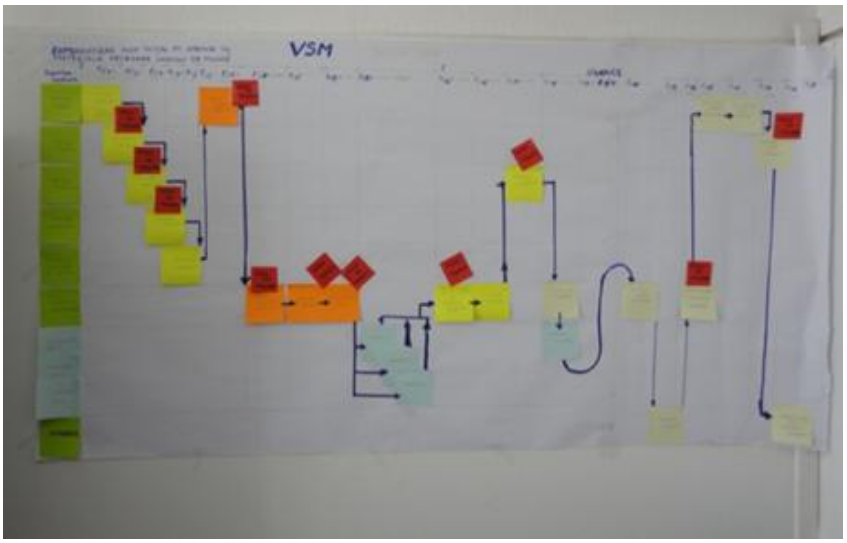

Figure 3. **The initial situation (VSM)**
Source: The VSD Hidroelectrica Report.

After the Muda Identification process, assessing every process (value added or waste), the team measured a lead time of 58 hours and 43 minutes, composed by 14 operations. They discovered also that after this workshop, they were able to improve the lead time with 81%, the value added time with 89%, to decrease the number of operations with 38% and to reduce the Movement Muda (the unnecessary movement realized by the operators in the supplying department) with 99% (Figure 4).

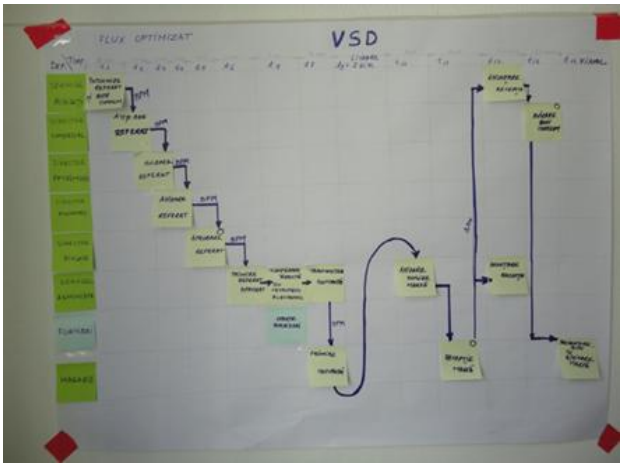

Figure 4. ***T*he Future Situation (VSD Vision)**
Source: The VSD Hidroelectrica Report.

In the follow-up working sessions, the working teams from Hidroelectrica managed to become aware of the benefits of implementing the KAIZEN™ Management System (KMS) and designed new action plans for developing new workshops for continuous improvement techniques.

The Dual technical professional education system: case of Kronstadt German Professional School (SPGK)

On the fundaments of a paradigm existent in Romania according to which the technical professional schools are not preparing specialists anymore, the number of the students of such institutions is significantly diminishing, in some zones appearing also the peril of disappearing completely. The old equipment and the lack of optimization of the curriculum to the current needs, as well as the continuous decreasing number of practice hours are representing the main factors for inadequacies of the technical professional system of education in Romania.

However, the qualification obtained after graduation of such courses has the potential of enhancing the grounds for a future carrier, if it is facilitated in an optimum way. The premises still exist, the need for qualified personnel with secondary education probably being one of the most/main demanded specifications, together with the implication of the economic agents in preparing the future technical specialists. In this concern, by applying the Dual German System (Table 1), a best practice example exists in the city of Braşov, named the Kronstadt German Professional School (SPGK), where the collaboration between the Kaizen Institute Romania, the German Economic Club and a group of companies, is supporting the development of the young generations, by offering them the necessary knowledge and practice for becoming their future specialized employees.

Table 1. *Comparative analysis between the Professional Romanian and Dual German System*

Romanian System	**Dual German System**
Targeted Group: 9th Grade Graduates (15-16 years old)	
Partnership: signing a contract between the school, economic agent, student and parents.	
Years of Study: 2 ½ Years	Years of Study: 3 Years
Percentage Courses/Practice: • 1st Year: 40%/60%; • 2nd Year: 25%/75%.	Percentage Courses/Practice: • 1st Year: 80%/20%; • 2nd Year: 60%/40%; • 3rd Year: 25%/75%.
Financial Support: • 200 RON from the State budget; • 200 RON from the economic agent.	Financial Support: • 100% supported by the economic agent
Final Exam: involving the school and the economic agent	Final Exam: involving the school and the economic agent (IHK Berlin)
Specialization: 2nd level Qualification diploma	Specialization: Qualified worker diploma

Source: www.sgk.ro.

Started in 2012, the Kronstadt German Professional School (SPGK) offers the opportunity towards 224 students to become specialists in the technical field, to benefit from financial support, at the end of the study period, having absolute priority of employment in 11 companies as numerical command operators or as electro mechanics. The professors of the school, as well as the professors' council and board of administration implicitly, are trained in KAIZEN™ methods and techniques, continuously improving the educational processes and establishing the curriculum of activities together with the 11 companies. The latter ones have experience in applying the KAIZEN™ Management System (KMS). Other benefits include the international acknowledgement of the diploma obtained, the possibility of continuing studies, and the continuous improvement performance monitored in terms of strategic management

and management by objectives of the school. "Together, we shape the future" is the motto of the SPGK, and it represents a promise for the investment in performance.

KAIZEN™ Education for Romania: The "Olympics in Management" Project

Designed as a sustainable way of active participation in education and business environments, the "Olympics in Management" Project represents an initiative of the Kaizen Institute Romania and Kaizen Manager Club Association (which joins together over 22 companies, leaders in their fields at the national and international benchmark level).

The main objectives are described as the following: "*achieving self-improvement skills among students, the Kaizen spirit, filling the gap between theory and practice by integrating them in activities deployed in companies that develop performing management systems and supporting them in finding a job in a company that would allow them a harmonious development for the benefit of society requirements*." (Julien Bratu, Country Manager of Kaizen Institute Romania).

The pilot project started in 2014, when the first two universities, The Bucharest University of Economic Studies – Faculty of Business Administration, in foreign languages (FABIZ) and the Polytechnic University of Bucharest – Faculty of Engineering and Management of Technological Systems (IMST) joined their efforts in the quest of finding the best students for the first edition of the program.

The selection process started by the recommendations offered by the professors who established the grounds of the partnership with the Kaizen Institute Romania, and after an initial evaluation and three benchmark visits at the companies applying the KAIZEN™ Management System (KMS), the first students were selected to become a part of the project. Its length is 2 years, in which the beneficiaries have the opportunity to follow the Gemba KAIZEN™ College Courses for specializing in the KAIZEN™ methods and techniques, structured in 3 parts: Practitioner, Coach, and Manager. The students who are becoming part of the project and manage to meet the ongoing evaluation criteria are also sponsored with a scholarship of 1000 €/year. They are elaborating different projects, activities and tasks for becoming performers in continuous improvement. The Individual KAIZEN™ sessions are representing other significant benefits for training in becoming "Olympics in Management", learning how to organize themselves and perform in an optimum way, for obtaining a harmonious lifestyle.

The second edition of the project continued in 2015 with a new generation of students, the extension of the project concept having as partners the biggest universities in Romania being perceived as the next step priority in the continuous improvement path of achieving sustainability of education and business in Romania.

Conclusion

The dynamic way of evolving of current times is stimulating the companies and individuals to become better every day and everywhere. In the international business environment, sustainability of businesses has become the competitive advantage that is required for an increased customer satisfaction and optimization of processes.

As it was seen in this paper, the best practices from different fields of activity of applying the KAIZEN™ Management System (KMS) are transmitting a powerful message

for all the major parts involved in the society: the continuous improvement is a must and it fights over the culture of mediocrity.

"The enterprise is NOT one of an owner alone but a public property and an organization of the whole society. Therefore, it is the participants' obligation to maintain its sustainability by a healthy condition in the enterprise activity, by the involvement and commitment of all the main stakeholders such as the manager, labor unions, and stockholders" (Keiki Fujita, Prof Emeritus J F Oberlin University Committee Chairperson, HIDA Tokyo).

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Approaches to strategic thinking in business organizations

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Abstract. *The concept of strategic thinking has been thoroughly discussed in the business and academic environments in the past decades. However, strategic thinking has proved to be a complex concept and has led to some confusion in the strategic management literature. Since the global expansion of big business organizations, such as the multinational and transnational corporations, the need for strategic thinking has continuously increased. As a cognitive process, strategic thinking involves creativity, thinking in time and change. By connecting the past, the present and the future, it allows business organizations to anticipate various trends, to create several scenarios, to decide on their goals and to determine the path to reach those objectives. The aims of our paper are to present some of the main approaches of the concept of strategic thinking, and to highlight its relevance in today's business organizations. Our research is based on a literature review. The paper has demonstrated that strategic thinking constitutes a key element of a winning company in a highly competitive environment. Also, it contributes to a better understanding of the concept and provides a platform on which to build further studies on the same topic.*

Keywords: strategic thinking, business organization, strategy, strategic planning, strategist

Introduction

The concept of strategic thinking has been thoroughly discussed in the business and academic environments in the past decades. Since the global expansion of big business organizations, such as the multinational and transnational corporations, the importance of strategic thinking has continuously increased. Without any doubt "the need for strategic thinking has never been greater" (Wilson, 1994, p. 14) and therefore strategic thinking has become a subject of great interest.

Several empirical studies have confirmed both the need for developing the research in the field of strategic thinking and for improving strategic thinking in many business organizations (Bonn, 2005; Bonn, 2001). All of these have led to a widespread consensus that strategic thinking is critical for the sustainability of current business organizations at a global level. This is why it should be constantly stimulated and nurtured within business organizations as thinking prefaces acting, and outstanding thinking contributes to excellent performances (Howard, 2009). By using diverse organizational methods and techniques (e.g., learning programs, coaching, mentoring), the global work experience (Dragoni et al., 2014) or creating a supportive organizational culture (Goldman and Casey, 2010) and work environment (Kazmi and Naaranoja, 2015) companies are interested not only in developing the strategic thinking ability of their managers and employees (Goldman et al., 2015; Self, Self et al., 2015; Goldman, 2012; Dragoni et al., 2011), but also in ritualizing it (Johnson, 2008). Therefore, strategic thinking can be done by any member of the business organization at any time (Monnavarian et al., 2011).

Arising from the above discussion emerges two following questions:

- What is strategic thinking?
- Which are the main approaches to strategic thinking in business organizations?

In order to obtain answers to these questions, we used a methodological approach based on a literature review.

The aims of our paper are to present some of the main approaches of the concept of strategic thinking, and to highlight its relevance in today's business organizations.

Literature review

The field of strategy has become so fragmented that scholars' opinions as to what represents strategy are often opposed (French, 2009). In spite of the fact that they did not agree upon a common definition of the term ''strategy'' they have admitted that a clear understanding of the concept can only be gained by recognizing the role played by one of its main constituent, strategic thinking. This assertion is based on the fact that strategy can be considered as "a revelation of voluntary, systematic, rational, objective, but also emotional, sentimental, affective, intuitive action" (Hafsi and Thomas, 2003, p. 516). Also, as a perspective (Mintzberg et al., 2005), strategy determines the future of a business organization and strategic thinking is thinking about its future. Thus, the evolution of strategy and the evolution of strategic thinking are highly connected in the business world. Moreover, as the value of strategy has grown within business organizations (Koch, 2000) so the significance of strategic thinking does the same.

An inquiry into the business literature shows that there are different meanings of the term "strategic thinking". It has proved to be a complex concept that has led to some confusion in the academic environment (Steiner et al., 1982) due to the fact that "a common definition of strategic thinking in terms of its characteristics is not found"

(Nuntamanop et al., 2013, p. 245). Strategic thinking has been defined in the past decades as:

- "the generation and application of business insights on a continual basis to achieve competitive advantage" (Horwath, 2015, p. 1).
- "an intellectual activity of synthesis" (Crouch, 2008, p. 155).
- "the systematic analysis of the current situation of the organization and the formulation of its longer-term direction" (Allio, 2006, p. 4).
- "a way of solving strategic problems that combines a rational and convergent approach with creative and divergent thought processes" (Bonn, 2005, p. 337).
- "the process of finding alternative ways of competing and providing customer value" (Abraham, 2005, p. 5).

All the previously mentioned definitions reveal a multitude of characteristics of the concept. Firstly, strategic thinking represents a cognitive process that involves thinking in time and change. Secondly, it combines rationality with creativity and analysis with synthesis. Thirdly, strategic thinking focuses on the future direction of a business organization. Fourthly, it aims at achieving competitive advantage for a business organization (South, 1981). Fifthly, strategic thinking identifies ways of providing value to customers.

Research methodology

Our paper aims to provide an overview of the main approaches of the concept of strategic thinking found in the business literature. In this respect we carried out a chronologically organized literature review (Lapan and Quartaroli, 2009).

The analysis of the literature was based on data collected from various books and articles published in journals. After the identification and reading the references, we summarized and synthesized the information on the topic of strategic thinking. The findings were presented in a sequential order.

Results and discussion

Since the emergence of strategic management in the 1960s the business literature has witnessed different approaches related to strategic thinking. Some authors have analysed strategic thinking from a multilevel perspective (Bonn, 2005), as a component of the strategy process (De Wit and Meyer, 2010) or created and developed models of strategic thinking (Casey and Goldman, 2010; Liedtka, 1998), while others have focused on the distinction between strategic planning and strategic thinking (Horwath, 2015; Graetz, 2002; Heracleous, 1998; Mintzberg, 1994b).

Mintzberg has stated that strategic thinking and strategic planning are often confused in spite of the fact that they are fundamentally different. In his view, strategic planning constitutes a systematic programming of pre-established strategies whereas strategic thinking represents a synthesizing process, a process of discovering insights (Mintzberg, 1994a) and a particular way of thinking which is based especially on involvement. In other words, strategic planning refers to an analytical thought process and strategic thinking refers to a creative thought process. Mintzberg believes that, in order to think strategically, effective managers have to be active, committed, stimulated and highly involved. This is why when senior managers cannot think strategically "either the managers must be replaced, or else others with that capability must be found in the organization, perhaps lower down where people are in closer touch with the operations" (Mintzberg, 1994b, p. 273).

Starting from the fact that any strategy implies vision Mintzberg has considered strategic thinking as "seeing" (Mintzberg et al., 1998). Thus, strategic thinking means:

- seeing ahead and seeing behind. The strategist cannot built a good vision without a deep understanding of the past.
- seeing above and seeing below. A successful strategist stays in the office, but also takes a walk inside and outside the business organization from time to time. He has to construct his own picture about the future of the organization.
- seeing beside and seeing beyond. In order to be creative and, therefore, design the future a strategist has to challenge the traditional and stereotyped thinking.
- seeing through. All the previous types of seeing are not enough for a strategist. He has to see through because he is responsible with the establishment of the business organization's direction (Montgomery, 2013).

The distinction between strategic planning and strategic thinking was also made by L. Heracleous. In his opinion, strategic planning represents a single-loop learning whereas strategic thinking constitutes a double-loop learning. Thus, the two concepts are not only different, but also necessary and complementary because creative strategies emerging from a divergent thought process (strategic thinking) have to be operationalised through a convergent thought process (strategic planning). Furthermore, strategic planning occurs periodically (e. g., quarterly) while strategic thinking occurs daily (Horwath, 2015). However, they have to sustain each other (Graetz, 2002) in order to deploy an effective strategic management process (Figure 1).

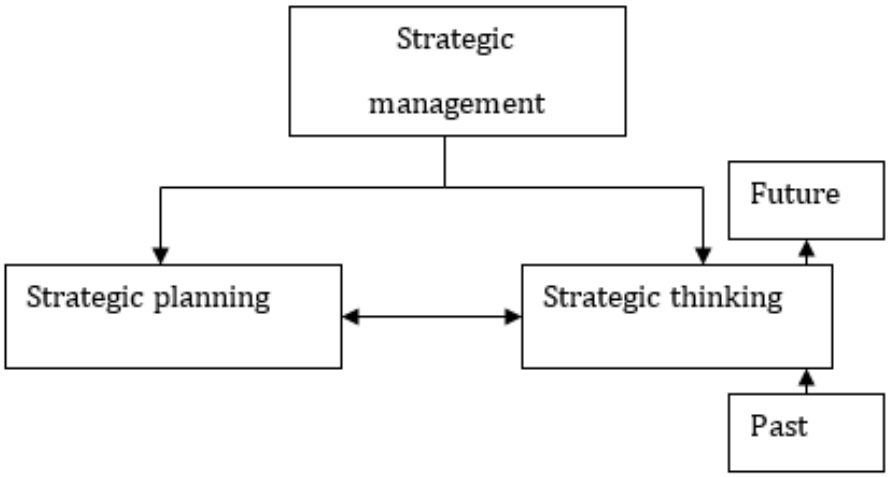

Figure 1. **Strategic planning and thinking**
Source: Authors' own contribution.

Launched at the end of 1990s the Liedtka model of strategic thinking is based on five elements (Figure 2). First of all, the foundation of strategic thinking is a systems perspective. The strategist has a mental model of the whole system of value creation and understands the inter-relationships within it. Strategic thinking is intent focused. This means that it implies a specific point of view about "the long-term market or competitive position that a firm hopes to build over the coming decade or so" (Hamel and Prahalad, 1994, p. 129-130). Strategic thinking requires business organizations to practice intelligent opportunism as they should be open to new experiences which

allow the possibility of the emergence of new strategies. Also, by connecting the past with the present and the future, strategic thinking is "thinking in time". Finally, strategic thinking imposes business organizations to possess the ability of developing good hypothesis and testing them efficiently.

Later, E. F. Goldman and A. Casey promoted another model of strategic thinking. Based on an interactive and iterative experiential learning process, it shows that individual factors (e.g., personal habits), work experiences (e.g., having a mentor in the early stages of one's career) and organizational factors (e.g., the handling of failures) interact with knowledge creation and perform together to generate and amplify the ability to think strategically.

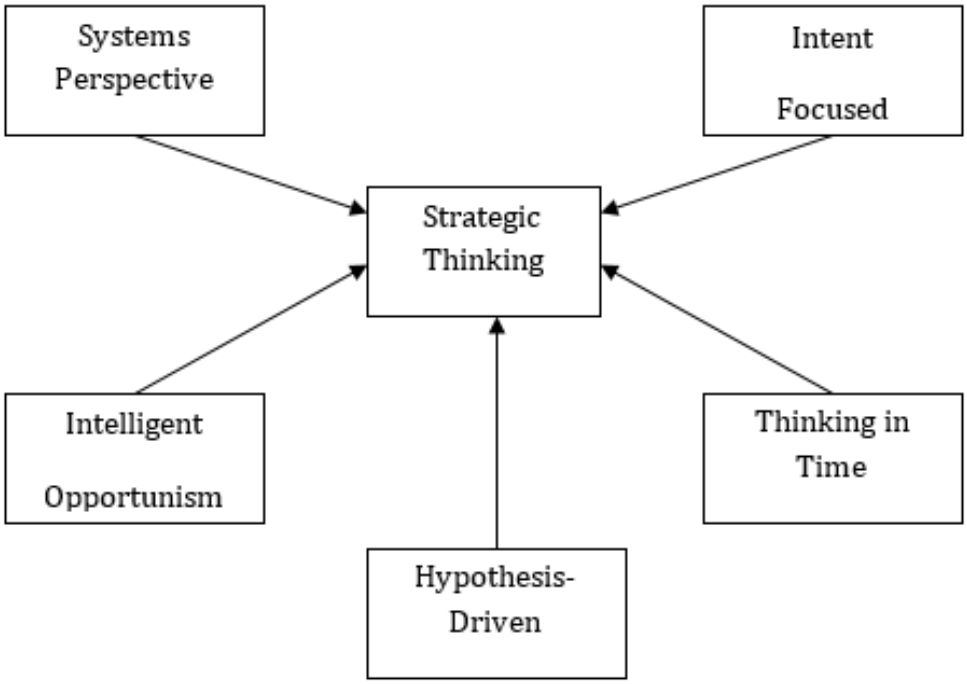

Figure 2. **The elements of the Liedtka model**

Source: Liedtka, 1998.

Strategic thinking together with strategic formation and strategic change are the components of the strategy process (Figure 3). Strategic thinking focuses on the strategist while strategy formation focuses on the strategy and strategic change focuses on the business organization. As the strategist is dealing with strategic problems, he has to experience a strategic reasoning process. This is why he needs to engage in cognitive/strategic thinking activities such as identifying and diagnosing the strategic problem. All these activities require both logical thinking and creative thinking (De Wit and Meyer, 2010). A more creative approach of strategic thinking helps the strategist to acquire new understanding of an issue (Bilton and Cummings, 2010). In fact, the strategy process has become a shared process of co-creative discovery that connects the business organization with its stakeholders (Ramaswamy and Ozcan, 2013).

All in all, strategic thinking should be analysed from a multilevel perspective. According to this approach, it is seen as an integrative process that mixes "the micro-domain's focus on individuals and groups with the macro-domain's focus on organisations and their context" (Bonn, 2005, p. 340).

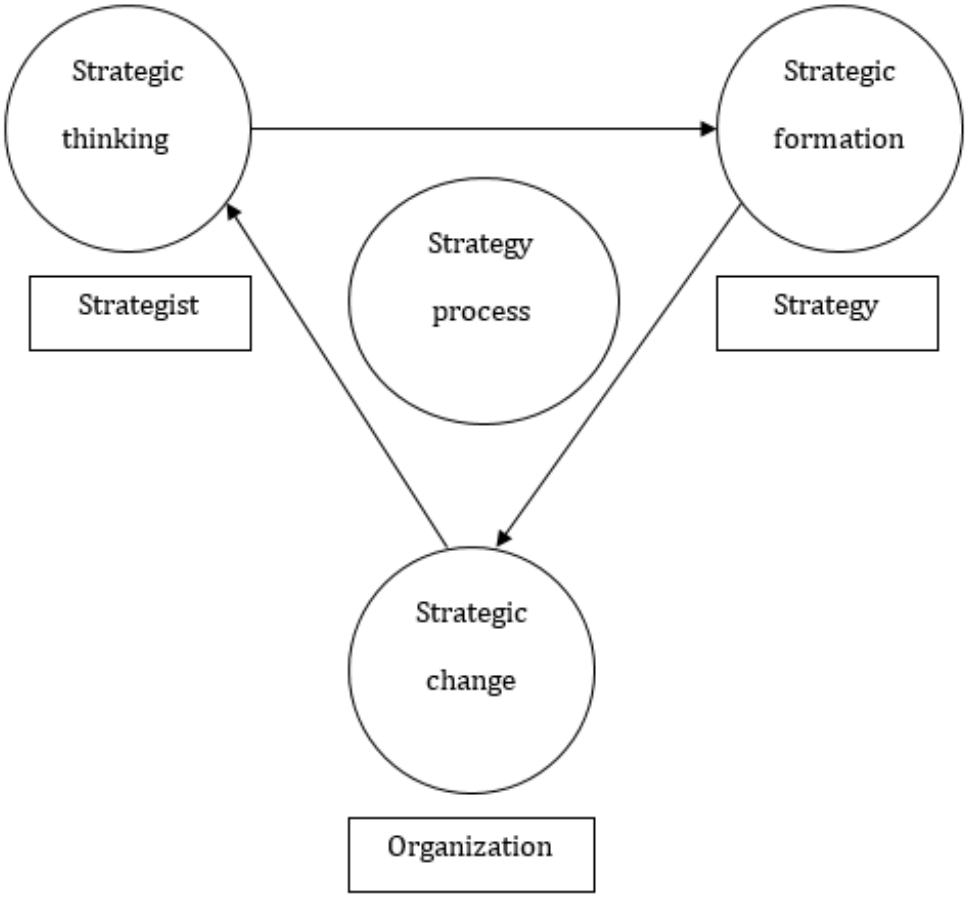

Figure 3. **The components of the strategy process**
Source: De Wit and Meyer, 2010.

Today's business organizations are fully aware of the importance of strategic thinking in designing and implementing their strategies. In order to formulate a viable strategy in a highly competitive and volatile business environment organizations have to engage in a strategic thinking process (Abraham, 2005). By connecting the past, the present and the future, strategic thinking allows business organizations to anticipate various trends, to create different scenarios, to decide on their goals and to determine the path to reach those objectives. In this respect, P. F. Drucker, the "father" of modern management, advocated the idea of establishing a solid foundation for strategic thinking through the identification of the essence of a problem/situation (Zand, 2010).

In essence, strategic thinking gives power to business organizations when is undertaken on a regular basis. By thinking strategically business organizations gain insight, increase their ability to identify solutions to their problems, better visualise and interpret both the internal and external environment and easier achieve their objectives.

Conclusions

Facing high-velocity change and continuous turbulence business organizations have understood that the ability to think strategically is critical to their survival and success in a chaotic business world. Without any doubt strategy is merely about insights and not

about plans. Strategic thinking and strategic planning are distinct concepts, but they are interrelated thought processes.

Strategic thinking represents the most relevant input for strategizing that is the core process of strategic management. As strategic thinking can be performed by any employee of the business organization at any level and any time it means that all has to engage more or less in strategizing. When is applied throughout the organization strategic thinking can lead to gaining a durable competitive advantage needed to succeed in the long term.

Our paper has argued that strategic thinking constitutes a fundamental element of a winning company in a highly competitive environment. Also, it contributes to a better interpretation of the concept and provides a theoretical platform on which to build further studies on the same topic.

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Smart homes and economic efficiency

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Abstract: *A bounty of innovative technologies, designed to improve our quality of life by integrating intelligent devices into various aspects of home living, have emerged in recent years. While a lot of these technologies have already graduated from the wishlists of the early adopters into the mainstream, there is still a lot to be said about the efficiency of the decision to go from home to smart home. Many technologies aim to increase comfort alone, while mostly disregarding concerns for costs; others aim to maintain or improve comfort while decreasing usage costs, typically those pertaining to energy and other utilities. Our study looks at those technologies which promise to yield the best results in terms of economic efficiency and analyses the relationship between current trends on energy markets and the price points required to make those technologies viable on a large scale.*

Key words: energy efficiency, smart homes, innovative technologies, renewable energy, Internet of things, home automation

Introduction

Scientists and society as a whole can easily agree on the general idea that the introduction of intelligent technologies correlates with improvements in terms of energy efficiency. This paper aims to quantify those improvements and, furthermore, translate them into economic efficiency. It has long been demonstrated that adoption of innovative technologies is closely related to their cost efficiency (Hall and Kahn, 2003). Technology does not become commonplace simply because it brings improvement, while it may become used for its inherent utility, it only truly spreads once the price is right (Hagspiel et al., 2015).

Method

The first thing required in order to conduct our analysis was a means by which to determine which technologies were most promising in diminishing costs. In fact, the method by which we identify these technologies was, possibly, the most important part of the research, as rapid advances in technology would impose that we update our list before completing subsequent steps of the analysis in order to keep up with new developments.

The technology selection model differentiates smart homes from other more-generic subject areas which would involve an equally generic cost efficiency analysis. When it comes to smart homes we simply cannot limit ourselves to accepting technologies based solely on pre-existing efficiency information. A lot of the technologies are simply too new and, as we will show in the pages that follow, significant boosts in economic efficiency can often come from the newest technology candidates.

The second step looks at ways to quantify the net gains resulting from the adoption of the aforementioned technologies. The value of these gains is far from being static as it needs to take into account both endogenous gains, resulting from the technology under scrutiny, and exogenous variations, determined by market factors, policy or even other technologies (Năsulea, 2014). For instance, it is not enough to compute how much money is saved by the introduction of smart thermostats by looking at energy savings from smart thermostats alone. One must also look at changes in insulation panel or window-pane technology. While these technologies are not mutually exclusive, and will often be used together, changes in price structure for one technology will change efficiency computations for all the others.

Finally, after analysing potential efficiency across the board, in the last step of the process we attempt to determine return on investment. Again, what would otherwise be a straightforward process in other fields can become a sinuous process once we take into account the particularities of the technologies being analysed.

Available data

There are many data sources that are constantly being updated which provide us much needed information about various technologies that make up a smart home (Green et al., 2015). A lot of data focuses on heating and cooling as they account for the largest portion of energy bills in both North America and Europe (Arendt et al., 2014; Ban-Weiss et al., 2013). Smart thermostats have great advantages over traditional ones as most of them cater for both heating and cooling systems, thus unifying the control structures and avoiding energy waste (Bowen, 2015).

Solutions also look towards smart and non-smart technologies that provide clean energy (Campillo et al., 2015), photovoltaic systems being particularly popular

solutions. Like all green energy sources, photovoltaic systems also benefit from being smart and, smart windows with embedded photovoltaic cells promise to provide huge boosts in efficiency by providing additional space that can be used for energy generation (Lu and Law, 2013).

When it comes to improved efficiency it's not just a matter of upgrading housing with new smart technologies (Ben and Steemers, 2014) but also about proper assessment of the efficiency of investments in energy optimization (Dimitriu and Caracota, 2015). The same way we analyse carbon footprints from a dual perspective, looking at operating impact and initial impact, we need to apply models designed to assess the financial effectiveness of new technologies (Năsulea, 2015) in order to determine the viability of implementation.

Model

Technology selection model

We begin by creating a list of candidate technologies and scoring them on their potential to directly affect utility costs in the smart home. For instance, technologies aimed directly at managing power, gas or water usage will be scored higher than technologies aimed at providing increased security and, security technologies will be scored higher than those aimed strictly at health-monitoring. The scoring in this example is based on current data on short-term, long-term and total gains of health-monitoring technology (Buntin et al., 2011), data on security system efficiency (Caputo, 2014) and data on marginal increases of efficiency in energy related systems in smart homes (Chan, 2008; 2009). In order to keep the model balanced maximum improvement by way of energy efficiency is capped at 10%. The average weight of utilities costs within personal expenses is used to determine the proportion to which this score affects the final result of the technology selection model (TSM).

Next, technologies get scored on their potential to reduce the time required to perform those activities that the technologies are meant to address. Scores in this category are estimated in terms of working hours (WHr) saved per month by the introduction of the new technology. A total number of 480 potential work hours is assumed based on a 30 day month and 16 hours awake per day.

While most research in the field touches upon the subject of quality-of-life (QOL) and despite the fact that accounting for changes in quality of life would bring enormous value to our model we were unable to develop a satisfactory means of assessing said quality. Indeed accounting for and, even better, quantifying QOL poses significant problems in terms of research methodology.

$$Tn = \frac{EEf}{10} \times Ut + \frac{WHr}{480} \times (1 - Ut)$$

EEf – Potential direct effect on energy efficiency
WHr – working hours saved through the introduction of the technology
Ut – Weight of utilities within personal expenses

Net gain assessment

Assessing the benefits of introducing a new technology is in principle a basic problem of economic efficiency.

$$NGm = Ef \times AMC$$

NGm - Net Gains from technology (monthly)
Ef - Gains through increased energy efficiency (%)
AMC - Average monthly cost of energy utilities

As every improvement inevitably entails an initial investment cost, we need to apply the principles of Net Present Value in order to determine the likelihood that a technology will become widespread. In order to apply the classical NPV formula we need to start by computing yearly gains (NGy) based on NGm. Discount rates should be chosen from available reference interest rates that best match the rest of the data in terms of jurisdiction and timespan.

$$NGpv = \sum_{t=1}^{ULt} = \frac{NGy}{(1+r)^t} - IC$$

NGpv - Present value of Net Gains
NGy - Net Gains from technology (yearly)
ULt - Useful life of technological implementation
IC - Initial investment costs
r - discount rate

Alternatively, the same reasoning can be used to determine the price point, we may also choose to call it Break Even Point (BEP), at which the technology becomes financially viable. BEP is, in fact, the IC that makes NGpv = 0.

$$BEP = \sum_{t=1}^{ULt} = \frac{NGy}{(1+r)^t}$$

BEP - Break Even Point
NGy - Net Gains from technology (yearly)
ULt - Useful life of technological implementation
IC - Initial investment costs
r - discount rate

Both for NGpv and BEP, under certain conditions, most notably when discount rates are negligible, it may be more practical to take a simplified, payback period approach. In this case, rather than computing present value for all potential future gains, we would simply sum them up at their nominal value.

Comparative decision model

Once enough data is available about competing technologies, we can move on to assess the potential spread rate of the primary technology. The assessment takes into account the amount gained from implementation of technology relative to initial investment costs and income.

$$f_{(BEP_{1\dots n,t}, IC_{1\dots n,t}, ULt_{1\dots n,t}, NIm)} = \frac{2\frac{BEP_t - IC_t}{ULt_t} - MAX\left(\frac{BEP_n - IC_n}{ULt_n}\right)}{NIm}$$

BEP_t - Break Even Point for primary technology
BEP_n - Break Even Point for competing technology

IC_t - Initial investment cost for primary technology
IC_n - Initial investment cost for competing technology
ULt_t - Useful life of technological implementation for primary technology
ULt_n - Useful life of technological implementation for competing technology
NIm - Net monthly income

Since we have previously established that

$$NGpv = BEP_t - IC_t$$

we could write the function in a slightly simplified manner by using the Present value of net gains directly instead of the expanded BEP - IC formula:

$$f_{(BEP_{1\dots t}, IC_{1\dots n,t}, ULt_{1\dots n,t}, NIm)} = \frac{2\frac{NGpv_t}{ULt_t} - MAX\left(\frac{NGpv_n}{ULt_n}\right)}{NIm}$$

NGpv - Present value of Net Gains

Optionally, an additional weighted parameter can be used on the top side of the function in order to account for the ratio between initial investment costs and net monthly income (Năsulea, 2016).

Technology assessment

For the purpose of this study our technology shortlist consisted in: Smart Thermostats, Transparent Photovoltaic Panels, Video Surveillance Systems, Personal Health Monitors and Whole Home Audio Systems. This mix of technologies broadly covers new advances in technology as well as the basic sub-fields in the smart home industry.

We asked 10 industry experts to rate technologies based on their potential to increase energy efficiency and to tell us how many hours they believed would be saved by introducing the technology. The financial importance of utilities within total monthly expenditures was determined to be 23%, based on data from the Eurostat (Eurostat 2014).

Table 1: *TSM scores for shortlisted technologies*

	Energy Efficiency	Working Hours	TSM Score
Thermostats	8.6	3.4	**0.0924**
Clear Solar Panels	6.4	0.2	**0.0644**
Surveillance	4.2	6.2	**0.0536**
Health Monitors	2.1	16.2	**0.0514**
Audio Systems	0.6	0.2	**0.0064**

Source: Authors' own research.

Based on the TSM scores, we determined that Smart Thermostats were the most promising piece of technology we could study and thus proceeded to the next step of our assessment.

Fortunately for us there is an abundance of readily available data on smart thermostat technology. The technology can hardly be described as "emerging", with a number of technological branches reaching maturity and becoming widespread on a global scale. There are studies carried out by manufacturers (Nest, 2015; Ecobee, 2014) and studies confirming or correcting their findings carried out by independent sources (WTR 2015, TSH 2016). There are even studies that look into the limitations of the technology and describe the scenarios under which they cease to be effective (Woolley et al., 2014). For the purpose of our assessment, after looking at the information available, we decided the average monthly gain in efficiency (21.5%) derived from the datasets mentioned above was realistic enough to be used in our economic efficiency estimation.

We turned our attention again to Eurostat for information on the average price per kWh for both electricity and gas. On average, as of late 2014, a European household bought electricity for €0.208 / kWh and gas for €0.072 / kWh. Since Eurostat data was used in our TSM score computation, it should be said that, while using data from the same source for this step of the assessment makes our process consistent, it also makes results Europe-related. The same price information for the US puts one household-consumed kWh at roughly half the price it goes for on the European market (Morris, 2015).

Of course, average energy prices for a market the size of the European Union, covering a large geographical area with very different weather conditions that lead to very different levels of energy consumption can only get us so far. Estimating net gains form reduced power usage requires access to information about the average cost of the utility bills themselves. Taking into account all the constraints previously mentioned requires harmonizing and processing large amounts of otherwise disparate data. Since the amount of data required for a single calculation of net gains based our model far exceeded our resources, the compromise solution in our case came in the form of average monthly value of total utility bills in the EU-28 countries for January 2016 (Numbeo, 2016) at €88.43.

Passing all the information through our NGm model we can estimate that potential benefits of the technology would have a value of €19.01 / month. Given that the average nominal useful life of a smart thermostat is 5 years and that the European Central Bank's long-term interest rate is currently at an all-time low of 0.05% we can compute the BEP for smart thermostats to be €1138.90, well above the €250 price tag of the NEST or ecobee. So, why then aren't all homes already smart homes? Why aren't smart thermostats already omnipresent?

Table 2: *Net Gains per month and Break Even Points for selected technologies*

	Net Gains per month (Euro)	Break Even Point (Euro)
Smart Thermostats	19.01	1138.90
Surveillance	16.84	1008.89
Health Monitors	48.59	1208.03

Source: Authors' own research.

While one of our original assumptions, and an important part of our model, was that competing smart home technologies influence the attractiveness of a given technology, through our application of the model to smart thermostats and the

subsequent analysis, we were able to determine that other, non-smart technologies, also influence adoption rates. In the case of smart thermostats, it seems their spread has been delayed in Europe by advances in heat transfer and insulation technologies. While we were able to compute the NGm and BEP for a few of the other technologies in the original shortlist with enough accuracy to allow us to use the data in the last stage of the assessment, we believe results would have been exponentially more valuable had it been possible to include competing, non-smart technologies in the model as well.

The Comparative Decision Model (CDM) required using net monthly income in order to compute the likelihood of consumers opting for the smart thermostat technology. Because the rest of our data was related to Europe or the EU, we decided that the best information at our disposal was the average European net income of €1469 per month (Fischer, 2015).

Table 3: *Present value of net gains in relation to the anticipated useful life of technology implementations*

	Present value of net gains (Euro)*	Average useful life (years)**
Smart Thermostats	888.90	5
Surveillance	758.89	5
Health Monitors	458.03	3

** Source: Authors' own research.*

*** NEST, ecobee, Foscam, Mobotix, Fitbit, Withings, Sony.*

Passing all the available data through our CDM we were able to determine that the likelihood of consumers choosing smart thermostats over other smart technology is 13.81%.

Conclusion

There is a fragile balance between the factors that influence adoption rates for smart home technologies. The decision is not simply about money, at least not in the way investment decisions are weighed in commercial environments. While company managers usually have no problems understanding net present value and acting accordingly, when it comes to the home user, the decision is a mix of sensible economic behaviour and extreme subjectivity. Yes, net gains arising from increased energy efficiency will be appealing in the long run but only if they are also palpable in the short run.

Most technologies that get shortlisted as economically viable are far within the boundaries of economic efficiency. Their current price points are already well within the range required for their increased dissemination. As anticipated, the factors that seem to delay their permeation are related more to their alternatives and not to these technologies themselves. Other external factors influence the way the model works significantly. At this very moment, in many places on the globe, reference interest rates make the results of the assessment model more homogeneous within the same large economic zone. Also in the news, record low prices for oil are influencing the energy markets in ways that will drastically alter the results of our assessment a year from now.

There is consensus among academics and industry experts alike that QOL is very important to smart homes and to technology in general. Unfortunately, there is little in the way of progress towards a truly effective way to quantify QOL and user satisfaction.

The model is more suitable for application to smaller geographical areas and smaller samples of population. Applying the model at the level of the EU was easier because statistical information was easier to find, but it was also more inaccurate due to the significant economic differences between member countries. The model could be expanded to better cater to large markets. However, that would require obtaining homogeneous, atomized data for each small unit within the large market. The data would then be processed individually in order to correlate net income and utility bills from the same region before being aggregated into a super-model that would assess both technologies against their alternatives and economic regions against their neighbours.

Whether our assessment model manages to provide useful insight into which smart home technologies are more deserving from an economic standpoint or not, all available data points towards the fact that, overall, smart home technologies are here to stay and, they are going to continue to increase their presence in our everyday life.

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A conceptual analysis of business-university knowledge transfers in the energy field

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Abstract. *Our paper consists of a synthesis of the main research articles dedicated to the business –university knowledge transfers processes in the energy field in the business cases based learning situations, in the last ten years, in relevant research databases. Our method consists on tertiary data selection, filtering and processing, using appropriate content analysis software. For further investigation, the results of the literature review will serve as a basis for developing a structural equations model of the transfer processes, in between universities and business organizations. Our research outlines the types of collaborations (education related, production of energy, university – led business support, R&D and innovation) which were categorized after a thorough literature review, and will prepare the ground for addressing potential gaps and limitations, in our further quantitative analysis.*

Keywords: energy, business-university knowledge transfer, university-knowledge transfer, university-business partnership,

Introduction

The cooperation between industry and university represents an important source of improved technology of products or creation of innovations. The main aspect that characterizes this cooperation is the transfer of knowledge with the purpose of helping both parties achieve better results in the research process. Therefore, the transfer of knowledge must be structured, yet there is no consensus on the type of relationships that must be created, given the fact that they bring together different groups of people from different backgrounds researching different topics. In conducting the partnerships, the parties may create interface structures which can be: transference offices, associated foundations, business structures with a mission to interact with the academic sector, nonprofit research institutes, technological institutions, third parties and other institutions; these interface structure may be responsible for administering some aspect of the cooperation process such as the collection, administration and distribution of resources, making public that lines of research of the university, contact with potential business partners, the facilitation and maintenance of communication between parties (Segatto-Mendes and Sbragia, 2002).

Research methodology

For this literature review we have gathered the articles published between 2010-2016 found in four international databases (ISI Web of Science, SCOPUS, Proquest and ESBCO) on the topic of university-industry collaboration in the energy field.

The next step was to review all the abstracts of the articles found in the databases.

Table 1. *Articles reviewed on the topic of university-industry collaboration in the energy field*

Database	No. of articles found and reviewed	No. of articles accepted
Isi Web of Science	*35*	*7(6 similar to SCOPUS)*
SCOPUS	*27*	*6*
ProQuest	*448*	*10*
EBSCO	*290*	*2*
Total	***800***	***25***

Source: Authors' own research.

The typology of the activities that fall under the umbrella-term University-industry collaboration is not clear-cut because the interactions involve many different stakeholders operating at different levels and with different goals and the results are varied (Blackman and Segal, 1991). Thus, we have constructed the typology by focusing on the main outcome of the collaboration (new educational programs, innovation in products and services, business consultancy, production of energy etc.) in order to group the articles together.

Research results

Table 2. *ISI Web of Knowledge, Scopus and EBSCO databases – articles reviewed on the topic of university-industry collaboration in the energy field*

Type of collaboration	Articles
Education-based	Summer of applied geophysical Development of an industry-driven curriculum or AEss University-industry collaboration chairs initiatives Navarre A new certificate program in renewable energy
Support programs	University-led business support a case study of a regional program Hydrogen and fuel cell educational activities in Turkey
Production of energy	Environment assessment of BPSolar
R&D, innovation	Open innovation: Hong Kong Honest but broke: the dilemma of universities acting as honest brokers A new generation of fuel cell hybrid powertrain for public traffic Towards sustainable and environmentally friendly enhanced oil recovery in offshore Newfoundland, Canada

Source: Authors' own research.

Education-related collaboration

In this category we have included all the articles related to the study of university-industry collaborations which have as main aim to increase the students' work-relevant competencies and skills, enhance their employability, stimulate the development of new networks and foster entrepreneurial attitudes. In a study of four cross-sector collaborations between regional universities and energy firms in Norway, Thune (2011) distinguished between five main forms of co-operation for educational activities: (a) co-operation linked to competence development in the university college where companies provided material and financial resources; (b) co-operation linked to development of new study programs or further development of existing study programs within university colleges; c) co-operation linked to accomplishment of studies/programs through the organization of student activities such as term-papers or projects in co-operation with the companies; (d) activities directed to the transition from studies to employment such as career fairs, apprenticeships or internships; (e) R&D collaboration.

The development of new study programs is usually done by taking into consideration the needs of the businesses in the region and those of the public administration and coupling them with the strengths of the university department developing the program. For example, the new certificate in renewable energy provided by the College of Engineering and Science in Florida has taken advantage of the excellent and strong relationships with the energy-related sector and of the excellent working relationships with local governmental units and agencies (Zilouchian and Abtahi, 2012).

The person usually responsible for such partnerships is part of the top leadership, usually a vice-chancellor dean, but the practical aspects are managed by a small number of staff in one or several departments.

A way of formalizing the involvement of the industry in educational activities is through the setup of industry chairs, as the one described by Sanchis et al. (2014) at the Public University of Navarre in which the chair is responsible for: (a) Engineering degree final project works, master thesis and doctoral thesis in cooperation with the company, (b) specific internships in the company for undergraduate and master students, (c) awards for best Engineering Degree Final Project works, master Thesis and Doctoral Thesis in the company field of interest, (d) joint research projects in the short, medium and long term, (e) conferences, seminars open to professors and students and related to the company fields of activity, (f) technical training courses given by the university professors to the company workers. The management of the Chair is done by the Steering Committee of the Chair (equally made up of members from the company and university professors which approves the budget and decides responsibilities) and the head of the Chair which is appointed by the Rector from one of the professors. The company funds the activities of the Chair and the university covers the installation and maintenance costs.

However, not all professorships funded by utilities companies are seen with welcoming eyes by the public. In a study of Swiss nuclear utilizes partnerships with universities, found that even though the utilities funded a professorship without getting involved in the appointment of the new professor and they guaranteed total freedom of research and publication, these contractual safeguards did not make the public feel and less wary in relation to the results of the activities performed by the new chair of nuclear technology: “Whenever I say something positive about nuclear energy I am immediately seen as being ‘bought’ by the industry” says the current professor.

The motivation of the companies comes from their big recruitment challenges, but also from their intention to contribute to strengthening the competitiveness of their region. The fact that the energy industry is facing workforce challenges has also been the motivating factor behind the setup of the SAGE (Sumer of Applied Geophysical Experience) educational programs which seek maintain the expertise in exploration geophysics and meeting the challenges of the future through applied research in partnerships between SEG and industry, academic institutions, the US geological survey and government laboratories (Baldridge et al., 2015). In this regards, companies also see their engagement with the universities as means for them to develop new environment-friendly energy technologies.

Collaboration for the production of energy

An astounding investment ($54 million) was deployed by the Australian Government in 2016 in university-industry renewable technologies collaboration. The purpose is to develop successful projects focused on solving a number of industry challenges that will transform Australia's energy networks and systems. Funding will support a diverse range of projects including new ways to produce biogas from sugarcane, investigating how robots could capture data for solar installation diagnostics and the production of low cost materials for use in the industrial refrigeration market.

Collaboration for university-led business support

Prochorskaite (2014): The RESCO programme was funded by the Regional Development Agency and focused on four RE technology areas – wind and marine power, power generation and transmission, bioenergy technologies and small-scale renewable technologies. The leadership, strategic development and day-to-day management of the programme was carried out by a research and consultancy unit based at Staffordshire University. However, the technical expertise for the four technology areas was delivered primarily by nine specialized consultancies procured through a competitive tendering process. The programme provided support through events (conferences, company exhibitions), special interest groups (workshop delivered to a small group of companies, technology demonstrators, visits to selected company sites) and diagnostics (one-to-one support delivered by consultants to identify company's current capabilities, strengths and opportunities). The study revealed that the companies preferred networking and group-based activities over one-to-one consultancy, they requested a cleared articulation of programme aims, a greater focus on industry needs, and they preferred someone with industry knowledge and insight such as a chamber of commerce or a business-focused unit within a university to fund and manage the programme.

Collaboration for R&D and innovation

Quantitative data shows that the development of an innovative and unique business model with the potential to enhance a company's competitive advantage tops the list of drivers for IUC–open innovation, technology complexity, and increasing customer demands for more in- LAM: OPEN INNOVATION 93 Innovative products, as well as reputation management create considerable impetus for companies to take the open-innovation pathway by collaborating with universities (see Figure 2). A closer look at the composition of the survey respondents reveals that the majority are SMEs (13 out of 16 companies). These companies are searching for innovative and unique business models to enhance their innovation capabilities, as SMEs generally lack such capabilities in house. Large and small companies look to universities for collaboration to enhance product differentiation and reputation management. Innovative products developed in partnership with universities are considered by clients/customers as more credible and reputable and therefore more competitive in the market (se o measures are necessary to move local industries out of the current deadlock to take advantage of IUC open-innovation. They include funding support for SMEs in technology development and innovation, and institutional mechanisms to help local industries locate the right university collaborators.

Conclusions

Factors of success:

Usually collaborations develop from relatively small activities and projects which provide a basis of trust and understanding on which further, more resource intensive co-operations such as R&D collaboration can be built – small projects lubricate the co-operation.

The key persons in the universities usually have a business background or long-experience in co-operation between HEIs and companies, but there needs to be an

organizational commitment and continuity for the collaboration to work – creating a stable structure for collaborative partnerships leads to continuity and higher satisfaction with the interaction

The geographical proximity matters for regional partnerships, but this needs to be coupled with a set of common resources and motives for the partnership to work;
Safeguarding academic integrity in the eyes of the public can be done through four strategies: (a) the university should have competencies in multiple fields, (b) third-party funding should not exceed 50%; (c) research contracts should ensure the freedom to publish research results, (d) industries should consider funding infrastructure and professorships as valuable alternatives to direct project funding.

Cooperation usually has three stages: the first one is when the parties enter into contact, the second one is represented by the exchange of data, proposals and contractual conditions and the last one is when the parties sign the actual contract.

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Priorities and strategies of sustainable development in tourism

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Abstract. *One of the leading industries nowadays is tourism, which distinguishes itself by competitiveness, the dual market structure and by its capacity of growth. In order to respond to the demands of tourists and to have a competitive advantage, company owners need to adopt sustainable tourism practices by innovating. This study seeks to identify what practices are adopted and implemented by some companies from the North East region of Romania, the level of innovativeness, which are their priorities and what are the determinants. A survey was used and it was distributed to 141 respondents that activate in the tourism industry. There were analysed the responses to 22 of the survey's Likert scale items, exploratory factor analysis was performed to identify which are the external factors that influence sustainable practices and the types of strategies alongside Anova test was conducted to see if sustainable practices are adopted for the same reasons or there are differences and Mann-Whitney U Test to determine differences in the choose of priorities.*

Keywords: sustainable development, innovative strategies, sustainable businesses, social responsibility

Introduction

Research on sustainable tourism has shifted its direction in the last years because of its dynamic capacity and now it is associated more and more with quality of life, equity and even in some extension with mobile technology information. Actually because the industry of tourism has continued to explore all fields of technology of production and methods of conservation of the resources we can discuss now of good evolutions. Otherwise we would have been in the point where only simplistic approaches and fractioned ones have been developed. Innovation in tourism has focused mostly on efficient technologies that can help destinations to handle the scarce of resource, big consumers of energy, population growth and the gap between rich and poor.

Research on sustainable development in tourism has focused on various aspects like: the importance of the community, policy types, the visitors, the stakeholders, destination/product, operator, government etc. (Lu and Nepal, 2009). It is interesting to find out if for our region selected for research company owners believe that their performance has increased after they have incorporated in their business strategy sustainable development initiatives.

As such different institutional initiatives have been adopted over the years that have impacted the evolution of businesses and their core strategy. The business models that embrace the principals of sustainable development have different strategies now, which are towards innovation. They are grouped in eco-innovation business models and their core structure is towards promoting sustainable practices, services and their number is on growing path.

The present research brings in discussion actions that have been adopted by different organizations in the North East region, what were their priorities that lead in the end to specific strategies and tries to find the response to the reasons that motivate companies and hotels to adopt sustainable practices. The main objective was to discover if they were made changes into the strategy of companies that activate in the North East region, which aspects were modified, if the focus has changed towards different priorities and were the drivers for such transformations. As well the research is focused on the characteristics that determine the new businesses that emerge in the tourism industry in the North East Region of Romania and if there are similarities with other businesses of the same type in European Union.

We based our research on two hypotheses regarding the type of businesses that adopt strategies that embrace sustainable practices from North East region of Romania:

H1: *Companies that have innovative strategies are new ones, start-ups and the positive success is because of the personal interests of the owner and commitment.*
H2: *For the larger companies the number of priorities regarding the sustainable principles is quite small and mostly the strategies are towards social responsibility.*
H3: *Most of the practices and actions that are developed regarding the concept of sustainability are isolated and are not directly linked with the business strategy.*

The rest of the paper is structured as follows: in the first section it is presented the literature review regarding the concept of sustainable development and its connections with tourism; we introduce the methodology and present statistical analysis then we discuss the findings; what are the results and finally the conclusions. Relationship between tourism and sustainable development

The importance of the tourism industry in the pursuit of sustainable development is one that cannot be questioned and represents one of the major

objectives of the European Union. Tourism for Europe represents one of the main industries that brings each year a great number of jobs, over 20 million jobs, accounts 10% of the EU GDP while one of ten businesses that activate in the non-financial economy is connected to the tourism industry (Eurostat, 2015). The tourism industry also presents implications related to the social and environmental aspects (Williams and Fennell 2002), some which might be irreversible (Ali and Frew, 2014) and all of this show how vulnerable the industry is. When we discuss about sustainable tourism we think of a new form of progress a responsible and positive one, that accounts the following 4 aspects: the capacity of preserving the natural resources, the amount of importance devoted to the social aspect, the heritage and biodiversity; the nature of the strategy implemented in a holistic manner and the consideration that productivity accounts the scarce of resources and thinks of the future generations (Lu and Nepal, 2009). Many of the studies made regarding the concept of sustainable development have not taken into the account the direction of the economy and the limits of eco natural even if some authors like Malthus, Mill, Carson and others pointed out in their researches. Some have pointed out that sustainable development represents only a societal project seen as ecological social and democratic and is a form that is presented in speeches rather than actions translated in results (Pestre, 2011). Other meaningful researches have showed that sustainable tourism is an *adaptive paradigm* (Hunter, 1997) while others sustain that is more of an *adaptive management* (Farrell and Twining- Ward, 2004) as it sums up the complexity of the concept and its unproductivity. It cannot be achieved only with the participation of the community (bottom–up) or by the government top-down (Ramet et al., 2005).

With all of the research made in the last 40 years the definition on the concept is ambiguous and because of its complexity it is interpreted, perceived and understood differently and its actual translation into facts is short (Bell and Stellingwerf, 2012). Actually in order to discuss about the applicability of the principles it needs to be adapted to multiple scales of action and to all of the regions.

Sustainable development looks for the protection of the environment, contributes to the local development and tries to increase in novelty the tourist experience with the lowest possible impact on the nature (Honey, 2008; Chih-Hsing Liu et al., 2015).

The tourist experience and satisfaction represents in essence the main motivation for the companies that activate in tourism industry. For that reason knowing their demands, behaviour and intentions firms have adopted in a higher degree eco-innovative practices. Studies show that larger companies have implemented them in their businesses strategies and investigating what determines the process of decision making of tourists is a necessity for success these days.

Sustainability must represent a premise for today businesses and that means there needs to be taken into account the model of economic downturn and policies that acknowledge the need for satisfaction of the base demands.

Sustainable businesses

The development of sustainable businesses in tourism is a careful process in which there are adopted and pursued ethical business practices, new sustainable jobs are created and the social needs are taken in consideration while finds a balance between them all. Sustainable business can be also called social businesses and they have the approach of the three bottom line. That means that they look for the success in 3 directions: the economic profit, the people (social) and the planet (ecological). It is no longer sought only the economic profitability but its purpose is to respond to social needs while the society benefits as well. For that reason we take in consideration and resonate with the definition given to the concept of sustainable development in tourism

by Liu (2003): "*all types of tourism (conventional or alternative) forms that are compatible with or contribute to sustainable development*". This encompasses those companies that make use of sustainable practices in all kind of forms: energy saving, consume of water, different types of transportation, disposal of the waste, the materials used for construction, reduce carbon emissions etc.

These types of businesses are a new form of entrepreneurship that is oriented towards non-economic benefits, social equity, more environmentally friendly oriented and are more open to new ideas and rejuvenate market offerings (Le et al., 2005; Shepherd and Patzelt, 2010; Hapenciuc, 2015). Sustainable entrepreneurship it is be appreciated and adopted by some individuals but not in a high degree and the motivations that stay behind this decisions have been very little studied. One of these studies has been made by Shepherd and Patzelt (2010), which propose a model of recognition of the actions that emphasize, the environment and it is based on individual knowledge.

Findings show that there is a great number of options by which it can be measured the economic performance of a company. When it comes to the environmental aspect we face the challenge as this can be achieved either by the ecological footprint of a company or by its externalities which are rather for the short term. The ecological footprint can be seen: in the amount of waste, water consumed, energy used, land degradation, pollution and natural resources depletion. If till now there was a inclination from the companies to develop in an *ad-hoc manner* (Hall and Kirkpatrick, 2005) meaning there was very little attention given for the sustainable principals now companies have incorporated into their production technologies that help them to reduce the burden over the environment. In order to remain competitive companies have taken notice of the changing markets, the concern of tourists regarding the environment, cultural sites and heritage, the suppliers and the incentives offered by the government. Adopting eco-innovative practices represents great investments by adopting technological innovations, which unfortunately cannot be amortized in a short period of time. The European Union came in help by trying to integrate in its strategy the sustainable development, creating the mechanisms to offer financial support for small size companies, starts-up and to raise awareness about the benefits that come along. With all the regulations, national and international standards regarding the environment and the human rights business have less capacity to be profitable. The necessity to embrace this type of practices, sustainable ones, is seen by some with skepticism and only as a global pressure not a useful approach that fulfills a social need. What divides the actions of the firm is the short-term performance or the long term one.

Business strategies for companies in the Tourism Industry

Businesses need to underpin where they are currently positioned from the perspective of the life cycle of business, as this will help them with their operational side of the business and with the strategic planning process. A voluntary interest for adopting and implementing sustainable practices seems to be the one that leads for successful businesses (Rangel, 2000). Kiráľová and Pavlíčeka (2015) points out that the basic purpose of a strategy is to increase destination competitiveness along with increase of the number of tourists, positive awareness etc.

Companies no longer search for new markets but rather try to adapt to the market and to the evolution of behaviour of tourists.

New business models make use of innovation, green innovation and that offers them leverage over other firms as well represents a natural form of growth, gives support to the local economy (Taylor, 2008) and enhances tourists appeal (Graci &

Dodds, 2008). Finding new instruments to create added value for tourists as integrating sustainable practice (eco-innovative practices, green practices) denotes a firm that chooses to do business better rather than differently (Dibra, 2015).

Information communication technology is used in various ways and form in a company that activates in the tourism industry. Nedelea and Aziri (2013) point out that business strategies in tourism should focus on *the product renewal strategy, the diversification strategy, the low season travel product strategy* and *the distribution strategy*, which are all various types of marketing strategies. But for surviving to today's market realities the most desirable strategies are those that link together green growth with innovation.

Innovation and tourism

Strazdas (2003) sees innovation as a dynamic phenomenon that puts in danger the old forms, norms and traditions of a company. Innovation is defined as a new method or process that improves a product or service, even new ideas or practices (Rogers, 1995) that are perceived as new for those who make use of it. The most recognized characterization of the concept of innovation is given by Joseph Schumpeter which incorporates all new concepts, new products, new markets, new forms of organizations or new raw materials. Nowadays innovation is no longer associated with big changes that affect a particular individual (OECD, 2004). It is linked to codified knowledge and for the tourism industry in the majority of cases the product innovation it is visible. Hall and Williams (2008) point out that innovation is when a new way of resolving a problem is found either with the help of a new budgetary system, cutting costs or improvements at the communication level. For tourism innovation is associated with the modality in each the visitor experience can be increased, where the products or services are improved, more efficient, where it is added value to a particular product or service, new ways of solving a problem etc.

The factors that influence the adoption of innovation are not completely known but there are some studies, different theoretical models (model of analysis cost / benefit, theory of the innovation's diffusion, stakeholder theory) which assess that behind the intentions lays the support of the government or described as *positive attitude of the government*, the desire from the part of tourists (Ozsomer *et al.*, 1997) and because of the competition (Kotler *et al.*, 2003). According to Roger (2003) and to Wejnert (2002) these factors can be categorized in three sections:

- Innovation characteristics (relative advantage, complexity, compatibility and observability);
- Organizational (or adopter) characteristics (firm size, risk taking and the eagerness to adopt sustainable principles);
- and external environment characteristics (change of the tourist demand, competitors and regulatory policies).

For the tourism industry Hjalager (2010) arguments that innovation in tourism can be found in the: product or service; the process; managerial or organizational; in the management and institutional innovation. The most common type of innovation in tourism is the product or service in a percent of 70.7% (Aldebert et al., 2011).

Methodology

Instrument Survey

The questionnaire consisted primarily of closed-ended questions and was divided into three main sections: (1) demographic information; (2) research topic, purpose of this

research; (3) main body for measuring items and the period spanned from March to September 2015. The questionnaire was completed and returned by 60 hotel participants, 38 tour company participants and the rest consisted of 43 participants from the rest of the tourism industry out of 460 selected for the survey which represents a 31% overall response rate.

The survey contained 22 questions out of which a great number were with multiple-choice questions, it was used the five point Likert scale for ordering and ranking the responses to some of the questions. Only one open-ended question was used in order to validate some of the closed questions used in the questionnaire.

Statistical Analysis

In order to highlight the most common priorities made by business in tourism there have made analyses for all the three pillars of sustainability: social, economic and environmental.

The age of respondents under 25 is a percent of 21.4%, between 26 and 35 a percent of 77.2 %, between 36 and 45 years 1.4% while above 46 years no respondent. The highest percentage regarding the seniority is distributed for 1-5 years of work a 82.9%, while between 6 and 10 years of work 12.9% and a percent of 4.3% for more than 10 years of experience.

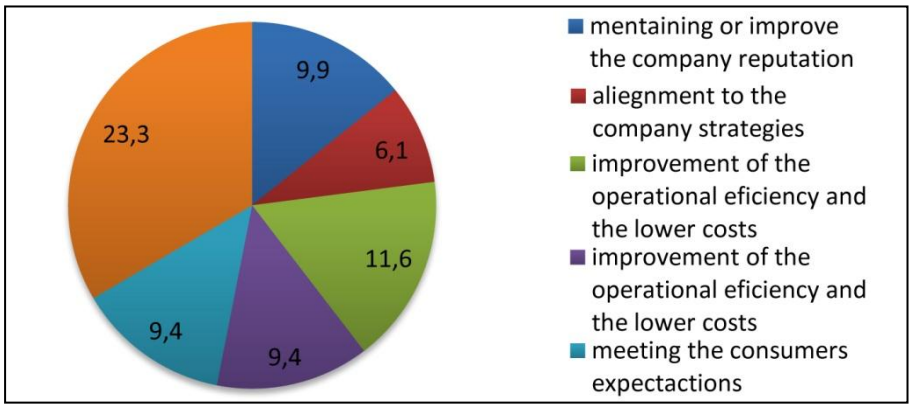

Figure 1. **The common motives for adopting sustainable problems**
Source: Author's own contribution.

Figure 1 shows that among the motivations of companies' owners that activate in the tourism industry new ways of growths represents the one with the highest scores 23%, while alignment with the company strategies is an option chosen by only 6.1% of the respondents.

Regarding the type of communication and the commitments made towards sustainable principles the companies choose to have informal presentation in a percent of 22%, followed by options like: communication with the social responsible investors in a total percent of 18%, no external communication for a 13% and with the lowest number of responses *participation to indexation or classifications related to sustainability*.

We have made use of the *factor analyses* to depict independent variables, as it a method that simplifies the data and reduces the number of variables in the models that use predictive regression. A frequent method used in the extant literature. As such two factor analyses were pursued in order to illustrate variables that present two

constructions of hypotheses: external factors that influence sustainable practices and the types of strategies.

The current researched showed that for the first factor analysis all the items are highly correlated with each other and that they are consistent with the theoretical construct. In the same line were the results for the second factor analyses and the items were correlated with each other and consistent with the theoretical construct.

The ANOVA test was conducted to see if sustainable practices are adopted for the same reasons or there are differences. The result showed that there is no statistically significant difference regarding what practices should be adopted first or last. For a particular type of individuals, owners of hotels perceive in a higher level the recognition from the part of customers. For the tourism operators the perception regarding the level of the programs and incentives from the part of the government is slightly higher than the other respondents. Another difference is that for the other category of respondents that work in the tourism industry consider that the access to suppliers and vendors is a setback for their motivation in adopting more or some sustainable practices.

Table 1. *The results of ANOVA Descriptive*

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Tourism agency	20	.9235	.19535	.04368	.8321	1.0149	.62	1.25
Hotel	20	.9740	.29605	.06620	.8354	1.1126	.22	1.50
Company	17	1.2100	.30253	.06765	1.0684	1.3516	.62	1.79
Total	60	1.0358	.29299	.03783	.9601	1.1115	.22	1.79

Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
.974	2	57	.384

Source: Author's own contribution.

In what concerns the implementation of sustainable practices in the activity of the companies and were the subject of your study the responses where divided and there is no consistency or too much resemblance in how they adopt the principals for their company. The results can be observed in Table 2 and we find that companies integrate the principles in the strategic planning in a percent of 26% followed by marketing with 19,2%.

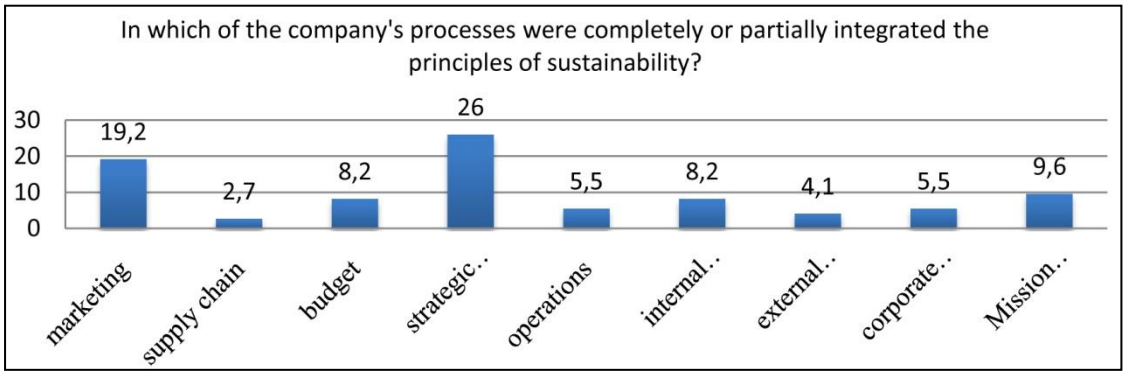

Figure 2. **Company activities**

Source: Author's own contribution.

Another variable measured is the activities that make use of sustainable practices and how they are organized. The result indicate that there are two main directions adopted by firms: *sustainability is embedded in daily practices of the business with a formal program that addresses the problems 31,5%* and *some activities but are not synthesized in a specific program to address sustainability issues 27,4%.* The results are consistent with findings by Bohdanowicz (2005) and others researches such as Graci (2009), Holcomb et al. (2007) that assess the fact that the number of initiatives differ according to the size, ownership and location. Our respondents differ in the firm size, the firm age and of course the location.

Results have presented that the most appreciated and desired strategy for the region is the one that makes use of the cultural identity: *Using cultural identity as the region's development strategy which aims at creating territorial brands / region and aims to identify local specificities* in a percent of 44%.

We have examined what is the order of priorities for 5 actions: 1. *Investments in tourism products and experiences according to market needs and strategic priorities*; 2 *Attract and retain motivated staff; their professional development*; 3. *Increasing the visibility of Romanian tourism offer, hence the North East region;* 4. *Overcoming barriers to investment and business competitiveness; 5. InvestmentS in infrastructure and environment.* The answer received ratings (ordinal data) and we considered that a nonparametric test was appropriate: Mann-Whitney U Test, results can be seen in Table 2.

Table 3. *Mann-Whitney Test*

Descriptive statistics

	N	Mean	Std. Deviation	Minimum	Maximum
DATA	55	8,64364	11.12001	.00	32.00
GROUP	55	1,4545	.52223	1.00	2.00

Table 4. *Company activities*

Ranks

GRUP		N	Mean Rank	Sum of ranks
DATA	Tourism	38	6.60	66.00
	agency	17	14.40	144.00
	Company	55		
	TOTAL			

Source: Author's own contribution.

The results of the test were in the expected direction and significant, z = -2.911, p < .05. tourism agency that choose priority 1 had an average rank of 14.40, while companies that choose priority 1 had average rank of 6.60.

However only 13 respondents chose to answer to the open question and the data is insufficient to detect correlations between the independent variable and the strategies. The answer brought new insights and show that companies are in different stages of adopting sustainable practices either with the help of technical or administrative innovations, knowledge, or want a higher support from the part of the government. A common argument is that they wish to be more investments in the infrastructure and transport. This way they could offer tourists other types of

transportation in common. Managers are motived by diverse factors to adopt and implement sustainable practices and one new characteristic that distinguishes is the risk taking. There is a need for exploring and communicating the right priorities to be implemented in their strategies. It is a process that evolves over time and helps to establish the priorities and to understand the aspects of the technologies that can be adopted, how can they change or contribute to the business. This is called road mapping and for businesses that what to make use of innovation is a useful tool that helps for the long term planning of a company and priorities (Mark de Reuver, Harry Bouwman, Timber Haaker, 2013).

Conclusions

Our first hypothesis was confirmed, new companies startups, small companies have different businesses model strategies and are willing to take risks and see the complexity of implementing and adopting sustainable practices. They are less sensitive in taking this approach and it is mostly a personal motivation from the part of companies' managers/owners. Changes have been made in the strategies of companies and the effects are different. The stages and levels of adopting sustainable practices depend of the perceived benefits. Government policies represent for many companies a real boost in adopting sustainable principles and the priorities are distinctive. For cities like Iasi and Piatra Neamt companies perceive competition as a factor to adopt sustainable practices and are interested in sharing examples of innovation and creativity. Again the d*evelopment of vocational training, creating opportunities and offering support in the development of employees and managers in the industry* is perceived differently and represents a top priority only for companies from Iasi. Regarding the second hypothesis it has not been confirmed in totality as results showed that the number of priorities is higher that expected but the strategies are mostly towards social responsibility. The findings suggest that the third hypothesis is confirmed and only certain companies have a correspondence between the business strategies and their actions regarding sustainable practices. The rest of them because of diverse characteristics: financial aspects, regulatory ones, organizational, perception of the customers, demand of the customers, time of implementing the innovations target only some directions/pillars of sustainability. In order to achieve more regarding environmental innovation there should be more opportunities to combine the efforts of the public sector and private one. It requires extensive work from the part of companies and time frame as innovations come only after multidisciplinary cooperation and networked collaboration.

What we can conclude is that for the region analyzed innovation in tourism is a its early stages and the number of priorities that are tackled varies because of the type of company and geographical location. Managers give importance to the intangible resources and offer to the public information about the improvements in the company and actions taken that support sustainable development. The make use of marketing and human resources to improve their image.

We consider that future researches could be made in order to investigate how firms change their behavior and adapt their strategy in 5 years.

Acknowledgement

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Business sustainability – with or without an HR strategy

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Abstract. *The present paper pleads for the awareness of HR strategy importance, in terms of proper design and implementation, as they definitely could impede or sustain the development of an organization. By making use of G.VALI, the model of organizational culture dynamics, we look for revealing the impact that (non-)existence of HR strategy, its alignment and coherence could have on the organization success. As proven by human experience, all types of strategies could work and be effective in certain conditions. Even more, nobody can say that one strategy is better than other. However, in the same way, there is no guarantee of some strategies success. In this light, the difference lays in the handy and clever interlock of the country specific advantages and firm(-to-be) specific advantages. For achieving this specific aim, vertical (alignment) and horizontal (coherence) integration of each functional strategy must be ensured.*

Keywords: HR strategy, alignment, coherence, functional strategy, organizational culture, G.VALI model

Introduction

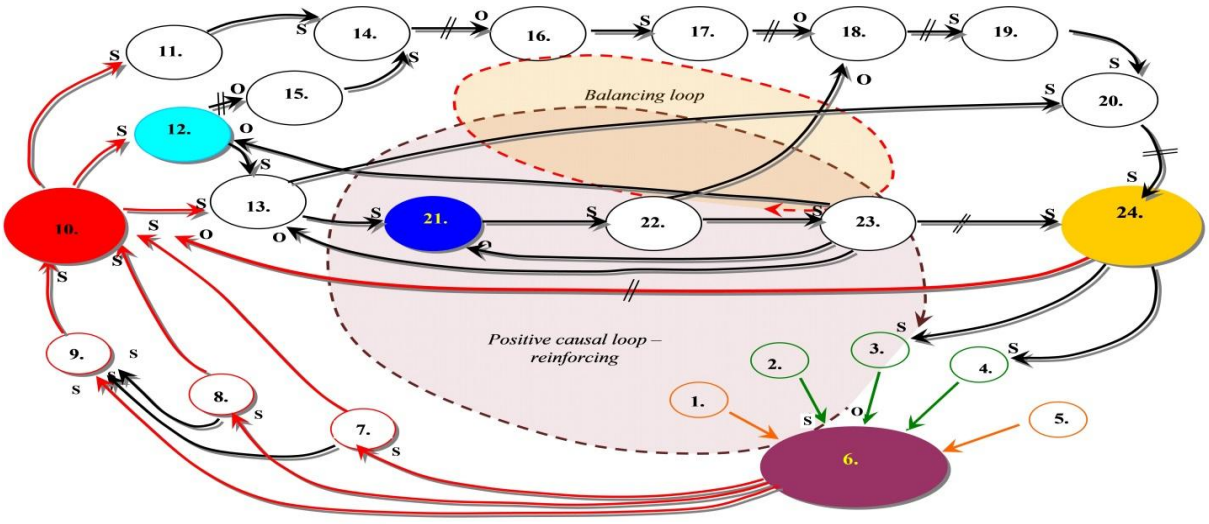
As proven by human experience, all types of strategies could work and be effective in certain conditions. Even more, nobody can say that one strategy is better than another or guarantee some strategies' success. In this light, the difference lays in the handy and clever interlock of the country specific advantages and firm(-to-be) specific advantages. For achieving this specific aim, vertical (alignment) and horizontal (coherence) integration of each functional strategy, whatever they are, must be ensured.

Therefore, the present paper does encourage decision-makers to focus on the logic and consistency of the business itself, on what are the requirements necessary to satisfy, rather than on what is fancy and glamorous as concepts and practices.

Methodology of research

Starting from the idea that any organization, irrespective of its complexity, behaves as an adaptive compex system (Forrester, 1999, p.9), we repel the perception of the organizational culture as a static element meant to only assure tradition and continuity within an organization, and we hereby *advocate the necessity of continuously guard the alignment and coherence of the HR strategy*.

To this end, we recall *Gradual Value-Added Leadership Integrator* model, G.VALI (see figure 1), conceived for exploring the organizational culture evolution within an organization, whatever should be (Ghinea, 2016).



Where:
1 - cultural advantage;
2 - family education;
3 - school education;
4 - self-education;
5 - innate features (native patterns of feeling);
6 - Individual World Map (IWM, individual representation of reality);
7 - enthusiasm;
8 - ability to develop a vision / mission;
9 - motivation;
10 - leadership skills;
11 - intrinsic motivation;
12 - ICT adoption/assimilation;
14 - degree of creativity;
15 - quantity and quality of tacit knowledge;
16 - level of individualism;
17 - competitive environment;
18 - team work;
19 - number of rules and regulations;
20 - bureaucracy;
21 - business processes;
22 - fear of the unknown;
23 - resistance to change;
24 - change of values, beliefs, behaviours.

Figure 1. **G.VALI model of organizational culture dynamics**

Source: Authors' own contribution.

This is the outcome of an extensive theoretical research grasping more than 300 scientific articles from different fields such as: organizational culture, information technology, business processes, management and leadership, vision and mission, systems dynamics, modeling and simulation (Ghinea, 2015a; Ghinea, 2015b, Ghinea et al., 2015c). Going beyond the revealed leadership – organizational culture interdependency, the model imparts:

a. constant adjustment of the organizational culture parts, as they respond to the propagation of causal impulse triggered by the decision-maker;
b. constant readjustment of leadership manifestation shaped by the influence of organizational parts themselves and organizational culture depictions'.

By overlapping the influences exhibited within an organization and highlighted in the studied scientific literature, graphical representation of the social system embodied in was achieved.

For better exploring its functioning, this model was transposed into the tenet of TRUE simulation software. Thus, by running the simulation, changes of leadership were proved likely to impact the whole organizational system dynamics, including its culture. On the other hand, rather numerous continuous inter-conditioning were pointed out within and outside the organization. This is why a solid understanding of both existent organizational interconnections and multiplier effect of its parts is required.

In compliance with the above findings, the 3D modeling of the organizational culture dynamics was conceived (figure 2).

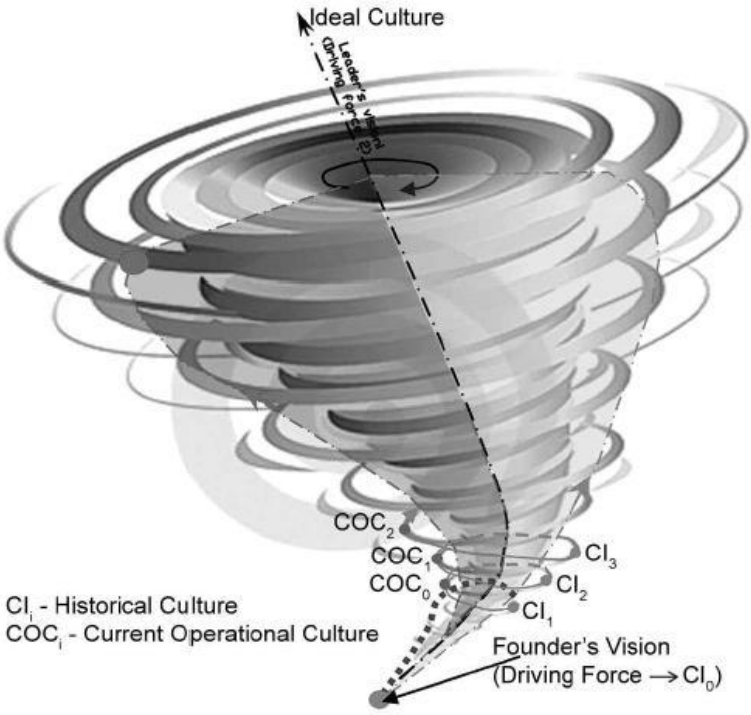


Figure 2. **3D modeling of the organizational culture dynamics**
Source: Authors' own contribution.

Given the leader's influence not only on the essential features of the organizational culture, but also on the evolution track that the latter is urged towards, to him was assigned the triggering power of outlining deliberately or not the

organizational culture. Thus, if a start-up is considered, the founder is assimilated to the leader and the driving force consisting of his vision occurs once the business is conceived. Along the time, the organizational culture gradually enriches in terms of number of heroes, prominent personalities, innovative solutions that greatly influence the organization evolution by means of behavioral requirements related to both leader and subordinate position.

On the other side, as it is shown in Ghinea (2016, p.100), socio-political and economic reality causes the unforeseen deviation from the guiding rules adopted during its launch, leading towards a so-called *current operational culture* (COC_i). This, along the time and due to the evolution and adjustment, overpasses the initial vision of the founder, leaving it behind as a *historical culture* (CI_i).

Thus, gradually, the current organizational culture (COC_i), left behind, renews its status becoming a historical one (CI_i), and making room for a new brand current organizational culture (COC_{i+1}), "imprinted" by the new (type) of leadership. The ascending movement goes on towards an *ideal organizational culture,* making a leap each time that one or more intrinsic and/or extrinsic factors act on the organization system.

The more extensive, diverse and intensive organization history, the more numerous cycles CI_i – COC_i.

Shaping the evolution of organizational culture dynamic behaviour on the revealed perpetual ascending oscillation between historical organizational culture and current one, we thus assimilate it to the tornado concept.

Discussion

As all the companies seek for competitive advantage, they all have also to continuously monitor the effectiveness of their chosen generic strategy, as well as the vertical and horizontal integration of each functional strategy apart. However, we leave aside the external factors that could sometimes require the total or partial readjustment of the generic strategy, and we presently focus on the HR approach.

Due to the simulation of *Gradual Value-Added Leadership Integrator,* we consider the organizational culture as open, teleological system seeking for its ideal state, similar to a living organism. This itself provides the organization with an item of change that imposes along the time some HR strategy revisitings upon the following reasoning.

Being the epicenter of people management, irrespective of its size and structure, human resource department has as prior duty to attract and retain the most appropriate human capital. Staffing the entire organization and not only its own department complicates decisions, as it has to take into account, up to a certain extent, all the functional strategies. Ultimately, the HR strategy is shaped by what type of people the other functional strategies require for achieving their own objectives.

Forwards, for the efficiency sake, an objective assessment of the HR strategy capability to support the generic strategy has to be pursued. Nevertheless, HR strategy coherence has to be at high concern, given the reverberations that its implementation has on the other functional strategies'. Any mismatch between people's profile that HR department staff with the organization and demanded skills, knowledge and behavior jeopardizes the firm(-to be) success.

On the other hand, working together over longer periods of time causes sharing of values and opinion related to the organization's conduct. Thus, without even knowing, employees daily contribute to the creation of common thinking models and behavior patterns which in conjunction with tradition capitalization form the organizational culture (Hill and Jones, 1998; Nicolescu and Verboncu, 1999). The intriguing element is that exactly the culture shaped by more or less adequate staff subsequently *"guides and constrains the behavior of its very own members by means of its shared norms within the respective group"* (Schein, 2004, p. 8), so that, at the end of the day, some disruptions might appear. These can cause discrepancies at all levels.

It generally happens whenever there is no relationship between employees and management throughout the company or when the strategic objectives of the HR function are (no longer) the same with the corporate ones (lack of alignment).

However, it is not only the average employee's appropriateness which is sensitive. Sometimes, managerial staff misfits the organization, as well. Far from being totally unpredictable, to a certain extent, this is also the liability of HR specialist as recruiter.

In spite of all these, where internal and/or external conditions of the organization are generous, firms afford to neglect aspects pertaining to the organizational culture and even to exercise poor management, without facing immediate negative consequences. This can only confirm the words of Kwantes and Boglarsky (2007, pp. 204-230): "*since the organization continues to function efficiently* (despite its lack of coherence in vision, strategies misalignment, and dysfunctional organizational culture), *decision-makers will claim the credit, attributing them to their own behavior and/or management style, and failures will be considered to be due to external factors".*

However, instead of being gone with the wind, successful entrepreneur, manager and/or HR specialist does not neglect to foresee the evolution of his own organization and of the world itself, and take advantage of. Afterwards, it is not futile to envision the desired outcomes and to work in a coherent manner to achieve them.

Conclusion

A sound HR strategy, skillfully implemented, identifies the goals and the direction that managers and employees at every level need to take in order to define their work and make their organization successful. Such a strategy provides the organization with the appropriate people able to identify, understand, and make use of their competitive advantage. In contrast, without a clear HR strategy the organization is rudderless. As the organization flails about in the absence of a clear, coherent and consistent generic strategy, dashing off in one direction after another as opportunities present themselves, and never achieving a great deal, the same happens in the case of HR strategy: the organization will become just a congeries of human typologies, having difficulty in understanding each other and in achieving common ground.

Strategic Management of Human Resource could create an indestructible competitive advantage in front of the competitors, as the methods used by a company to hire appropriate people, and subsequently motivate and manage the gathered human capital are not only hard to understand, but also difficult to copy and reapply by its rivals.

If a company creates a winning HR strategy and implements it successfully, having the support of both the management team and of the employees, this will definitely cruise along for a significant period of time without encountering serious issues (Society for Human Resource Management, 2006).

The (non-)existence, size, organizational structure, as well as the involvement of the HR department in the organization "life" go hand in hand with the adopted HR strategy and thus they are closely linked to the overall strategy of the organization. Given the fact that the secret of success does not reside into the generic strategy type, but into its implementation (which is characteristic to each organization apart), the attempt to impose from outside the organization ways of HR tasks impartment, HR department reduction, or even inducing the idea of the HR specialization gradual suppression, all these are just utopias or simple fads. Trends have always existed. Beyond that, it is important that the choices made by the organization in terms of its own structure and/or functionality to sustain its efficiency and effectiveness on the long-term.

Strategy is not fixed but fluid. Strategic management is continuous and iterative. But as long as there is a clear alignment between what the company dreams to achieve and what the HR department is focusing to recruit, hire, motivate and retain in terms of skilled and capable human capital, the owners of the business can rest assured that from internal perspective the success is guaranteed.

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Theoretical approach to quality management in the higher education system in accordance with the International Standards Organization

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Abstract. *The paper proposes a theoretical approach to quality management in accordance with the ISO from the definition and outlining the principles and procedures for quality assurance system. In the first part, the paper aimed at describing the main functions of the evaluation process, and exemplifies the educational policies of the European Union on the concept of self. The end of the paper presents some objectives and proposals on education to facilitate taking quality as a top priority in the education system but also of each educational unit.*

Keywords: quality management, educational system, self-evaluation, educational policies, the International Organization for Standards system

The conceptual approach to the quality of management systems in the system of the International Standards Organization on the field of education

A quality assurance system in the field of education cannot be designed without taking into consideration performing the functions of marketing and of public relations at the level of all levels, forms and educational institutions. Whereas the latter does not exist or is there at a later stage, the development of a system for the management of the quality implies, in the first place, building and/or designation of organizational structures, who will perform the functions of the research and development, marketing and public relations at all levels of the education system.

In this context, the systems of quality management are defined as "the totality of the procedures relating to quality assurance which accompany the design, development and delivery of a particular product or service" according to the International Organization for Standardization in the field of quality management [2] . At the same time, the approach of quality of management systems in accordance with the system of the International Organization for Standards (ISO) is well known and the principles for quality management shall apply to all of the institutional structures and organizations (including those of education), which requires the certification in accordance with the standards ISO 9000:2000. These principles of quality management have in view the following general principles [3]: focus on customer; driving (leadership); the involvement of the people; procedural approach; systemic management approach; the continuous improvement of the organizational performance; factual approach to decision making processes; the development of mutually beneficial relations between the suppliers and the recipients of education.

As regards the focus on the customer, this implies research on understanding the needs and expectations of the beneficiaries. In a concrete manner, in the field of education this requirement is achieved by: systematic studies concerning the needs of general education at national level, ensuring links of the objectives of the organization and the needs and expectations of the beneficiaries, communication of needs and expectations of the beneficiaries at all levels of the organization; measuring client satisfaction through specific actions determined by results, systematic relations with the beneficiaries of education, etc.

As regards the second principle of management (leadership), it shall determine the need to clarify the vision and the policies and strategies for the development of the educational system and, at the same time, of the development of one organizational culture that will encourage the transparency and the participation of all groups of interest to the definition of strategic targets. This implies the public debate in all forms, the reform measures and the strategic documents, showing opinions and arguments contrary to those supported officially [4] and, on that basis, the completion of a strategy for the development of education on long term to obtain the agreement of the majority

[2] International Organization for Standardization, is an international confederation for the establishment of detailed rules in all areas with the exception of electricity, electronics and telecommunications https://ro.wikipedia.org/wiki/Organiza%C8%9Bia_Interna%C8%9Bional%C4%83_de_Standardizare.

[3] www.iso.org 2

[4] It may be see, as an example in this respect, the conclusions of the consultation of the various groups of interest in connection with the reform in education in progress in Northern Ireland, on the official website of the US Department of Education for Northern Ireland - www.deni.gov.uk

of the political forces and social partners, but at the same time to reflect the values and trends of the European Communities.

In this context appears as a necessity the implementation of the third principle, namely the people (e.g. teachers, directors, inspectors but also students and/or parents and/or tutors) in order to clarify the various roles and responsibilities in the field, up to ensure the quality of education - including as regards the role of the parents and that of the local public administration/ regional national/. Therefore, it can be concluded that the existence and functionality of a systemic vision on a domain - such as the one represented by education - reflects not only through the policies, strategies and operational plans, but also by a good communication between departments/ between components/ between subsystems, through the development of clear structures of communication, decision and reporting; i.e. A systemic managerial approach - the fourth principle to be taken into account in ensuring the quality management in the education system. Currently, it should be underlined that in Romania there are criteria's, indicators, instruments for the monitoring and assessment of the operation of institutions in the education system, but not to their development. It is therefore necessary the development of a mutually beneficial between the suppliers and the beneficiaries of education and the educational system should become a system opened to the requirements of the medium on which it services.

The characterization of the evaluation process of higher education quality at national and European level

It became obvious that the quality assurance of a performing university system is aimed just at interventions regarding the methods and instruments used in the process of teaching, or in the process of management of a university or in respect of relations of the system with the community.

Therefore it should be taken into account the method for the evaluation of quality in such a way that this concept to become a habit. Firstly , an important aspect to be taken into account is the attainment of the main functions of the quality evaluation as for example: Improving the current activity ; ensure feed-back for significant groups of interest ; revision and optimization of the policies and strategies of education at the level of higher education so that they can serve better the mission undertaken.

Secondly, another important aspect that must be taken into consideration in the evaluation process of quality assurance in higher education is that the system for the evaluation of quality must be sufficiently sustainable to be able to provide solid data, transparent, as determined by both quantitative and qualitative rigorous testing methods for the extent of the changes made. These two points listed above may be perceived as being somewhat contradictory and namely:

- On the one hand, it is necessary a system of evaluation built sufficiently "formal" in order to be able to ensure both the necessary objectivity,
- On the other hand, this system of evaluation should be "subjective", introverted, perceived as beneficial (not as "extra work") and perceived as being useful for all the parties involved in order not to trigger repulsive reactions or the type of "double rebellious".

Also, in order to ensure impartiality, quality and checking of the evaluations of higher education institutions, the European Commission has selected a Independently

Consortium composed of: the Center for higher education (CHE) of Germany and the Center for Political Studies of higher education (CHEPS) in the Netherlands; Center for scientific study; technological at the University of Leiden (CWTS); Scientific Publishing House Elsevier; Bertelsmann Foundation; Folge Software company 3. Among the main ideas that led to the initiative called U-Multirank "we note : avoid simplistic rankings; evaluation of universities in relation to 30 individual indicators and five performance groups/five key areas; the introduction of the new academic fields; assessment to be carried out in functions and factors other than excellence in research, etc. By comparing the key areas of the System of Quality Indicators proposed by the National Council for the financing of higher education in Romania for universities' access to financing from the state budget with the method of valuation "U-Multirank" adopted by the European Union is found that in the system from our country is absent the group 'success in the transfer of knowledge, i.e. partnerships with the business environment and start-ups carried out". (See Table 1)

Table 1. *The system of quality indicators in the European Union and Romania for universities' access to financing from the public budget, in the year 2015.*

Performance Groups/ Five Key areas in the EU *)	**Performance Groups/ Four Key areas in Romania**)**
Performance of research	Performance of research
The quality of teaching and learning	The quality of teaching and learning
International orientation	International orientation
Success in the transfer of knowledge, i.e. partnerships with the business environment and start-ups carried out	
Regional involvement	Regional involvement and social equity

*) for the classification of the universities by the method of valuation U-Multirank;
**) for the classification of the universities for access to financing from the budget of the U.S.

Source: Authors' own processing.

In conclusion, improving quality assessment in education, training and lifelong learning is one of the main priorities of education and training of young graduates of higher education programs of EU - Programs - "Socrates" and "Leonardo da Vinci". However, the Council and the European Parliament have supported the question of promoting quality evaluations of higher education, and the goal of quality education was a priority, especially on cooperation and training.

Educational policies of the European Union on the concept of self-evaluation, as a way of assessing the quality of the education system

External evaluation of the quality of a system is not always enough. This is why this should be supplemented and (sometimes) even replaced with the concept of self-evaluation. Also, we must emphasize that at present the need to create a "culture of self-assessment" is more and more strongly claimed and encouraged by the education policies of the European Union , as follows: the existence of projects and thematic networks dedicated to self-evaluation financed by the European Union through the

"Socrates Projects [5] "; the implementation for the procedures of self-assessment of the project entitled " Common European Framework for Quality Assurance in Vocational Education and Training(CQAF - VET) [6] "; ensure the quality of education at national level [7] and international level [8] through the introduction of complementary systems and procedures for external evaluation and self-evaluation; the promotion of the concept ''self-evaluation'' in order to ensure self-regulation, optimization and revision of the operation and development of the "real-time" of organizations "who were in charge of the process of education and continuous training'.

As a result, detailed rules for quality evaluation , for not to create fear and distrust, must be undertaken on a voluntary basis at the level of the education system. This tandem must be carried out, in the form of the self-assessment. In conclusion, the durability and the quality assurance procedures depend on the capacity of schools to learn from their own experience, to develop, to apply the tools developed but also to innovate. All of these have as an essential procedure self-evaluation, as a result, the development of an instrument/s of self-evaluation, carried out jointly and assumed at the cultural level and not only formally, constitutes an essential path of quality assurance of education.

Conclusions and proposals

This study revealed the fact that in the field of quality of education, it have been taken relatively few research and analysis. In addition, at European level there has not yet been consensus on what means a "good school". However, the diversity of national systems of education at the level of the European Union, explain the absence of "the acquis communautaire in the field of education". However at European Commission level they are trying to define certain principles, standards and quality indicators specific to the domain. Thus, the process of defining the principles, standards and quality indicators for the education system is slow and difficult due to the existing differences between the Member States and the candidate states. Thus, we can say that at the level of each member state there is a national system of education that uses different elements of management and quality assurance . This lack of uniform assessment of quality of the education system highlighted at European level is due to the fact that between Member States there is a different degree of socio-economic development.

Due to this fact it can be concluded that it is not possible to identify a quality of education, but this is according to: the values promoted in a society in general and at the level of higher education institutions in particular; the diversity of policies and

[5]For example Comenius Project " MICE-T - Model Instruments for a Common Evaluation - Teacher Training and the Project "I-SAMPLES-Net - International Project Based Evaluation Network " both projects aimed at encouraging the self-assessment as the form of the essential part of the quality assurance procedures. See " www.Mice-T.net " and " www.I-Probenet.net ".

[6] see on the web site of the CEDEFOP Http://communities.trainingvillage.gr ( ) all the information about the CQAF-VET

[7]for example, the quality assurance system of education in Scotland known as the model of How good is Our School: Self-Evaluation Using Performance Indicator (version 2002, published in 2001). The Scottish Education and Industry Department - www.hmie.gov.uk/documents/publication/hgios.html .

[8]for example, the quality assurance system of language services, promoted by the EAQALS ("European Association for Language Services of quality") which consists of a set of linguistic competences, the linguistic passport, linguistic individual portfolio, procedures for inspection and auto-evaluation etc. - see: www.eaquals.org

strategies of education at national, regional and local level; the state in the contextual factors are (for example: culture and traditions, etc.) in each Member State; the socio-economic evolution, both globally and national and the way in which this is reflected in the dynamics "Quality" concept.

In light of the above, this paper proposes the introduction of a set of principles and procedures effectively in other school systems, which can be adapted to the needs of higher education in Romania, taking into account that the quality assurance is a problem, primarily of political choice, such as the decentralization of functions, on communities, encouraging the financing from own revenues and subsidies.

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The importance of developing sustainable development as a key factor of economic efficiency

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Abstract. *Sustainable development is a major feature of current economies in Europe. It did not realize chaotic, but take into account the main pillars, form three different perspectives: economic, social and environmental. As economic factors are highlighted GDP per capita, hourly labor productivity, energy intensity of economy, as social factors are distinguished people of risk and social exclusion, life expectancy at birth and employment rate while for environmental factor is emphasized eco-efficiency. These factors act differently in all countries, but also act as a whole, having a greater effect than that produced by each factor taken individually. The paper makes a qualitative analysis of these factors, reporting Romania to the European Union countries. It highlights the major role of research, development and innovation as a impacting factor increase for business efficiency and improve the competitiveness of the companies. Policy makers can act for stimulating research, development, innovation and education, by providing incentives and tax breaks for the companies but also by organizing the budget balanced through supporting these domains. In the same time, the companies can stimulate research and innovation, through activities they perform and the inclusion in the purview of the technological innovations. All these type of decisions can lead to major positive results regarding the sustainable development of a country.*

Keywords: sustainable development, pillars of economic efficiency, energy intensity of the economy, eco-efficiency, relationship research-development-innovation

Introduction

According to Agenda 21 adopted in Rio de Janeiro in 1992 and Johannesburg Plan of Implementation, in 2002, it is necessary for sustainable development to be addressed strategically, considering the following components:

- International cooperation that facilitates accelerate sustainable development in developing countries and lead to lower economic and social disparities, promoting convergence;
- Restructure the purpose of saving consumption of environmental resources, increase the share of consumption of organic products and increasing waste recovery;
- Improve the relationship between demographic dynamics and sustainability;
- Combating poverty at local, regional and national level;
- Integrate sustainable development in decision-making processes;
- Management of resources for development;
- Increasing the role of civil society have components to substantiate decision-making processes;
- Promoting environmental education at school level and university.

Basically, we can speak of three interdependent pillars of sustainable development (economic, social and environmental). The main pillar of economic efficiency indicators are represented profitability and productivity of factors of production. When we refer to the social pillar, analyze first the welfare and social cohesion, and if pillar environmental sustainability are pursued and ensuring ecological balance dynamically.

Pillars of economic efficiency

When addressing the issue of sustainable development per capita GDP indicator gives us a coherent analysis of economic and social performance over different countries. The advantages of studying this indicator is enhanced when making a complementary analysis of other economic and financial indicators and ambient.

Table 1. *Evolution of GDP per capita in the period 2007-2013*

Countries	Years						
	2007	2008	2009	2010	2011	2012	2013
Romania	7,9	9,2	-5,8	-0,6	2,8	0,8	3,5
UE-28	2,8	0,0	-4,8	1,7	1,5	-0,7	-0,6
Euro Zone (18 countries)	2,4	-0,2	-6,7	1,7	1,3	-0,9	-0,6
Austria	3,4	1,1	-4,1	1,5	2,5	0,4	-0,1
Germany	3,4	1,3	-4,9	4,2	3,3	0,5	0,2
France	1,7	-0,6	-3,6	1,2	1,5	-0,5	-0,7
Spain	1,6	-0,7	-4,5	-0,5	-0,1	-1,7	-0,7
Italy	0,9	-1,9	-6,1	1,2	1,5	-0,5	-0,3
Bulgaria	7,0	6,7	-5,0	1,1	4,4	1,2	1,4
Hungary	0,3	1,1	-6,6	1,3	1,9	-1,2	-0,4
Poland	6,8	5,1	1,6	2,9	4,5	2,0	1,6
Czech Rep.	5,2	2,0	-5,1	2,2	2,0	-1,1	-1,1
Greece	3,2	-0,4	-3,1	-4,7	-6,9	6,7	...
Portugal	2,1	-0,1	-3,0	1,9	-1,1	-2,8	-0,5
Irland	1,9	-4,2	-7,3	-1,5	1,8	-0,1	-0,6
Switzerland	3,0	0,9	-3,1	3,1	0,7	0,3	0,8
England	2,7	-1,4	-5,8	0,9	0,4	-1,2	1,1

Source: Eurostat.

Regarding the dynamics of relevant indicators in sustainable development in Romania compared to other EU-28 countries it can be noted two important aspects:

- Unfavorable influence of the financial and economic crisis began in 2008, has led to a decline of GDP or less in all countries in 2009;
- Recovery of economic decline caused by the crisis has occurred, but in different time periods

Some countries have failed to recover economic decline occurred during the crisis, while others have recorded reductions of GDP in 2012-2013, after they managed to obtain a post-crisis economic recovery.

A part of the major European economies (France, Spain, Italy) failed to recover their economy immediately after the crisis and adopted a recovery plan with the slow European economy recovery. The strong European economic connections led to this solution. In comparison, Germany, the main European exporting country, relied heavily on exports with positive results.

Eastern European countries have had a different pattern. While Romania and Bulgaria have seen a major increase in 2011 followed by less significant increases in 2012 and 2013, Hungary and the Czech Republic experienced a decline of this indicator. Dependence from largest European market and Western European investments of these economies led to this evolution. In Romania and Bulgaria these dependencies were reduced, which has affected less. Poland was the surprise of the former Eastern Europe. Based on their own industry and the efficient use of European funding, including European Structural Funds, with an extremely high degree of absorption, Poland passed easier the difficulties generated by the crisis, with economic growth on every year.

At European level, the existence of economies with different resources and capabilities, the inexistence of a strong industrial sector balanced distributed on the entire union and different access to capital markets causes this disparities.

Large fluctuations of Romania indicator is due to the lack of a strong industrial sector and pronounced dependency of the Romanian economy on the European market. Also, the difficult financing of Romanian economy, the funding almost exclusively with foreign capital, with extremely high interest rates and tight lending conditions, determined limitation of the major investments in productive sectors.

Another indicator for economic efficiency is hourly labor productivity.

Table 2. *Hourly labor productivity in Romania compared to other countries in the period 2000-2013*

Country	Years								
	2000	2005	2007	2008	2009	2010	2011	2012	2013
UE-28	27,9	30,2	31,3	31,2	30,7	31,4	31,9	32,0	32,2
Romania	3,0	4,6	5,2	5,6	5,4	5,3	5,4	5,4	5,6
Bulgaria	3,4	4,0	4,3	4,3	4,3	4,5	4,7	4,8	…
Czech Rep.	9,3	11,7	13,0	13,0	12,8	13,0	13,3	13,2	13,1
Germany	37,3	39,3	42,0	42,0	40,9	41,7	42,4	42,6	42,8
Spain	27,3	27,9	28,5	28,7	29,4	30,0	30,4	31,5	32,1
Italy	32,0	32,4	32,6	32,4	31,7	32,5	32,5	32,2	…
Hungary	8,4	10,7	11,1	11,3	10,9	11,0	11,0	11,3	11,5
Netherlands	41,3	44,7	46,2	46,2	45,1	46,0	46,1	45,6	45,8
Austria	33,5	36,1	38,1	38,3	38,2	38,9	39,1	39,5	…
Portugal	19,0	15,6	16,1	16,1	16,1	16,7	16,9	17,0	…
Slovakia	8,2	10,4	11,8	12,1	11,8	12,3	12,6	12,8	…
England	34,7	38,9	40,8	40,3	39,3	39,8	40,0	39,3	39,2
Norway	65,0	73,1	71,1	68,8	69,0	69,3	68,9	69,5	69,6

Source: Eurostat.

Regarding the hourly productivity of labor, this indicator is less than 6 times in Romania compared to the EU-28, i.e. less than 10 times against Norway and over 6 times the Netherlands or Germany.

Disparities highlight the need for a policy mix for growth factors lead to sustainable productivity. As main causes can be noted poor industrial development and the lack of a highly qualified workforce. Also reduced financing possibilities, generated by high interest rate used in the banking system and low development of stock exchange do not allow for rapid development of the industrial sector.

An important indicator of economic efficiency at the macro level is the energy intensity of the economy (Ien), with relate gross domestic consumption of energy per 1000 euro GDP. If the value of this indicator is lower, the energy efficiency is higher.

Table 3. *Energy intensity of economy in Romania compared to other countries, between 2001-2012 (kg. ep. / 1000 euro GDP)*

	2001	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
UE 28	170,9	151,9	151,0	148,9	151,6	144,0	143,2
Romania	579,5	441,5	409,9	387,4	394,6	393,7	378,8
Bulgaria	1040,1	759,9	711,7	661,4	668,8	705,5	669,9
Czech Rep.	477,8	391,0	370,8	363,9	374,5	355,4	355,4
Germany	160,7	140,1	140,3	138,9	140,5	129,2	129,2
Greece	176,4	149,5	151,3	149,5	148,3	154,4	165,7
France	165,1	149,9	150,9	148,9	150,7	142,6	142,9
Italy	125,6	122,9	122,4	121,2	123,2	120,7	117,3
Hungary	344,3	290,6	285,9	289,7	294,1	281,6	168,7
Netherlands	158,5	149,8	148,6	149,8	157,7	144,7	149,4
Austria	133,9	129,1	128,3	125,7	132,2	125,0	123,9
Poland	432,0	350,3	336,9	319,8	328,0	314,7	298,7
Slovakia	599,5	387,6	375,7	362,2	369,3	348,3	329,3
England	140,5	112,1	110,8	109,9	111,3	102,8	105,1

Source: Eurostat.

As shown in Table 3, for EU-28, Ien decreased between 2001-2012 about 1.19 times. Declines in different countries were 1.52 times in Romania; 1.34 times in the Czech Republic; 1.06 times in Greece; 1.55 times in Bulgaria; 1.82 times in Slovakia; 1.06 times in the Netherlands; 2.04 times in Hungary; 1.08 times in Austria; 1.44 times in Poland; of 1.07 in Italy; 1.24 times in Germany and in England of 1.33 times.

We note that in Romania there Ien greater reduction was not cause by the use of environmentally friendly technologies, but was the consequence of the disappearance of uncompetitive energy-intensive industries.

Social pillars of sustainable development

The social pillar of sustainable development requires a complex system of indicators on the standard of living and level of comfort and education of the population. Among them, a particular importance is the indicators related to people at risk of poverty and social exclusion, and the average life expectancy at birth. The following table is captured evolution of these indicators in the period 2005-2012.

Table 4. *Indicators of the social pillar of sustainable development*

Country	People at risk of poverty and social exclusion (% total population)		Life expectancy at birth (years)			
	Years		Years			
	2005	2012	2005		2012	
			Men	Women	Men	Women
Romania	45,9	41,7	68,9	75,7	71,0	78,1
Average UE-28	25,3	24,7	75,4	81,5	77,5	83,1

Source: Eurostat.

It is noted that the indicator on people at risk of poverty and social exclusion highlights Romania's unfavorable position in comparison with the average among countries in the EU-28. Related to life expectancy at birth, Romania gap compared to the EU-28 in 2012 was 6.5 years for men and 4 years for women.

The differences between Romania and the average EU are large. They are determined primarily by the low income population and low labor productivity.

These causes make as the ratio between current expenditure and total revenue to be huge, making it harder the process of accumulation and increasing the risk of poverty or social exclusion. The cost of medical services is extremely high relative to purchasing power and some medical services are seen as a luxury service that few people can afford them.

The table below shows the employment rates among people aged 20-64 years.

Table 5. *Employment rates among the population aged 20-64 years*

	2002	2007	2008	2009	2010	2011	2012	2013	Europe 2020
UE 28	66,7	69,8	70,3	68,9	68,5	68,5	68,4	68,3	75,0
Bulgaria	56,5	68,4	70,7	68,8	65,4	62,9	63,0	63,5	76,0
Czech Rep.	71,7	72,0	72,4	70,9	70,4	70,9	71,5	72,5	75,0
Germany	68,8	72,9	74,0	74,2	74,9	76,3	76,7	77,1	77,0
Irland	70,8	73,8	72,3	66,9	64,6	63,8	63,7	65,5	69,0
Greece	62,7	66,0	66,5	65,8	64,0	59,9	55,3	53,2	70,0
Spain	62,8	69,5	68,3	63,7	62,5	61,6	59,3	58,2	74,0
France	68,6	69,8	70,4	69,5	69,2	69,2	69,4	69,5	75,0
Italy	59,2	62,8	63,0	61,7	61,1	61,2	61,0	59,8	67,0
Hungary	61,4	62,6	61,9	60,5	60,4	60,7	62,1	63,2	75,0
Netherlands	75,8	77,8	78,9	78,8	76,8	77,0	77,2	76,5	80,0
Austria	70,9	74,4	75,1	74,7	74,9	75,2	75,6	75,5	77,0
Poland	57,7	62,7	65,0	64,9	64,3	64,5	64,7	64,9	71,0
Romania	64,3	64,4	64,4	63,5	63,3	62,8	63,8	63,9	70,0
Slovakia	63,2	67,2	68,8	66,4	64,6	65,0	65,1	65,0	72,0
England	74,3	75,2	75,2	73,9	73,6	73,6	74,2	74,9	-
Switzerland	81,2	81,3	82,3	81,7	81,1	81,8	82,0	82,1	-

Source: Eurostat.

An important effect of the crisis is reducing of the activities of the various economic and social sectors, which increases the number of unemployed and in particular the growing number of youth under 25 who do not have a job.

It appears that the highest employment rates of older workforce, over the analyzed period, were recorded in the Netherlands and Germany, while the lowest were in Hungary and Greece.

In Romania was an increase in the employment rate in 2009-2010, followed by a decrease in that rate, a trend that was maintained until 2013.

2020 underemployment target was set at EU-28 level to 75% and the target for Romania is 70%. We believe that an important way to increase economic efficiency in Romania is to increase employment in particular through policies to promote mechanisms and facilities that are based on public-private partnership.

In table 6 is shown unemployment rate in Romania, compared with the EU countries in 2005-2013.

Table 6. *Unemployment in Romania compared to other EU countries in 2005-2013*

	Years								
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Romania	20,2	21,4	20,1	18,6	20,8	22,1	23,7	22,7	23,6
Bulgaria	22,3	19,5	15,1	12,7	16,2	23,2	25,0	28,1	28,4
Czech Rep.	19,2	17,5	10,7	9,9	16,6	18,3	18,1	19,5	19,0
Germany	15,5	13,8	11,9	10,6	11,2	9,9	8,6	8,1	7,9
Irland	8,6	8,6	9,0	12,7	24,0	27,6	29,1	30,4	26,8
Spain	19,7	17,9	18,2	24,6	37,8	41,6	46,4	53,2	55,7
France	20,6	21,6	19,1	18,6	23,2	22,9	22,1	23,9	23,9
Italy	24,0	21,6	20,3	21,3	25,4	27,8	29,1	35,3	40,0
Hungary	19,4	19,1	18,0	19,9	26,5	26,6	26,1	28,1	27,2
Poland	36,9	29,8	21,7	17,3	20,6	23,7	25,8	26,5	27,3
Portugal	16,1	16,3	16,6	16,4	20,0	22,4	30,1	37,7	37,7

Source: Eurostat.

We can say that in Romania the unemployment rate has a high level, especially among young people; fact that involves not only the low quality of life, but also it is an important factor of social tensions.

That talented young graduates leaving Romania in search of jobs abroad is a huge loss, leading to the widening gap between potential GDP and real GDP in our country and enhances economic and social differences to other countries.

It is noted that the staff dismissal is a superficial way, which leads to increased short-term social productivity of labor, but has serious long-term consequences. Such periods of unemployment, particularly when prolonged, labor force loses its qualification level or leaving the labor market in Romania. And when to return to economic growth is again necessary labor, will no longer find the necessary resources, thus producing serious imbalances in the medium and long term.

Environmental pillar of sustainable development

Eco-efficiency is a fundamental element in the sustainable development strategy. The term eco-efficiency was first used in 1992 by the World Business Council for Sustainable Development in the publication Changing Course, which promote the concept - obtain more goods and services using fewer resources and resulting in a lower amount of waste and pollutants.

On the occasion of the Earth Summit held in Johannesburg in 2002 they were based national strategies for sustainable development, whose motto was eco-efficiency.

Further, were established critical components of eco-efficiency as follows:

- Separation of development and resource use
- Decrease the intensity of materials/energy in the production of goods

- Reduction of dispersion of toxic materials
- Efficient use of renewable resources
- Ensuring recycling.

The basic characteristics of eco-efficiency mainly consist of:

- Business environment is the foundation of transformations that lead to eco-efficiency,
- Emphasis on research - on innovation and not on the retailer or consumer
- Develop replaced growth in order to achieve rational targets without excesses.

In July 2004 in Maastricht has been addressed sustainability in terms of eco-efficiency, which is a practical way of increasing competitiveness and reducing unemployment. On this occasion he was promoted the concept of 3C (Clean - Clever - Competitive) and five strategies have been proposed to support eco-efficiency:

- Encourage companies to become proactive in the sense of eco-efficient innovation
- Improving innovation by developing policies for eco-efficiency
- Integration policies regarding sustainability and education be made both at European and at national level
- Using a clearly defined system of financial indicators to encourage investment in eco-efficiency,
- Informing consumers about the eco-efficiency of products so they can find alternative products and services that are unsustainable or less sustainable.

According to specialists (Lovins, 2008), the most important aspects involved by eco-efficiency refers to the reduction of pollution for all environmental components, as well as increased use of waste and recyclable materials.

Eco-efficiency benefits related to maximizing freedom of choice, on discovering the best ways to reduce pollution and increase economic benefits achieved by companies using Best Available Control Technology (BACT) and Maximum Available Control Technology (MACT).

In terms of benefits for entrepreneurial eco-efficient technologies and methods address the following topics:

- Increasing market share
- More efficient use of energy and materials, which reduces costs,
- Design products with fewer toxic substances in the composition
- Improving productivity and environmental performance due to the reduction of toxic emissions and increasing waste recovery.

In the literature, the system of indicators of eco-efficiency varies according to countries and areas of use. Thus, there are:

- Indicators which influence the environment (energy consumption, raw material consumption, water consumption, greenhouse gases, ozone-depleting substances)
- Indicators possible to apply (total waste, acidic air emissions - HCl, SO2, NO2, NH3).

The relationship research-development-innovation, a competitiveness factor with impact on production of goods and services

In the acceptation of the World Economic Forum (WEF 2013) level of productivity of a country is determined by a composite index (GCI- Global Competitiveness Index). This index is calculated for 148 countries and is constructed by aggregating an overall score of weighted averages scores for 12 pillar indicators.

To determine the level of Romania's economic competitiveness globally, we conducted a comparative analysis of the situation of our country in the context of European integration.

In this sense, the table below is highlighted Romania's place in the global rankings of competitiveness, based on the pillars and sub-indicators related R & D in 2013-2014.

Table 7. *Romania's position in the global ranking of competitiveness, according to pillars and sub-indicators related RDI*

Pillar	Sub-indicators	Values				Rank Romania (148 countries)
		Maximum	Minimum	Romania		
				Value	% from maximum	
Pillar 4	Health and primary education	6,82	2,58	5,47	80,2	84
Pillar 5	Higher Education Training	6,27	2,07	4,41	70,3	59
Pillar 6	Goods market efficiency	5,59	3,03	3,89	69,6	117
Pillar 8	Financial market development	6,02	2,26	3,95	65,6	72
Pillar 9	Availability of assimilation of new technologies	6,08	2,03	4,14	68,1	54
Pillar 11	The quality of business networks	5,75	2,81	3,62	63,0	101
Pillar 12	Innovation	5,79	2,15	3,01	52,0	97
12.1	Capacitaty of innovation	5,8	2,2	3,4	58,6	90
12.2	Quality of scientific research institutions	6,4	2,0	3,7	57,8	64
12.3	Expenses for research and development of the companies	6,0	1,9	2,8	46,7	104
12.4	Collaboration between universities and industries	5,8	2,0	3,3	56,9	88
12.5	Procurement of technologically advanced products	5,6	1,9	3,2	57,1	99
12.6	Resources of scientists	6,3	2,5	3,2	50,7	99
12.7	Protection of intellectual property rights	6,2	1,6	2,9	46,7	110
GCI	Aggregate index	5,67	2,85	4,13	72,8	76

Source: The Global Competitiveness Report 2013 – 2014, WEF.

As shown in Tables 7, we find that Romania has a modest position (ranked 76 of 148 countries), with most indicators related to research-development and innovation. Thus, according to Pillar 12, Innovation, Romania ranks 97 in the world, and with regard to other sub-indices, also deals unfavorable position: rank 104 for expenses incurred by companies for research - development and rank 110 protection of intellectual property rights.

Also in the WEF 2013 was initiated a new strategy of competitiveness - Europe 2020 Strategy - that sets out 5 key targets to be achieved by 2020 by Member States. One of the major targets is the investment in R & D to 3% of GDP (target ceiling for Romania was subsequently set at 2%).

The following table notes that in 2011 in Romania, expenditure on research - development were 0.5% of GDP, so were below the EU average of over 2%. So that Romania can reach 2% by 2020, the average annual increase of these expenses should be 17.1%.

Table No.8. *Indicators for Romania's competitiveness compared with the average UE27*

	MU	2008	2009	2010	2011
Expenses for research and development	% in GDP				
Romania		0,58	0,47	0,46	0,50
EU27 average		1,92	2,01	2,00	2,03
Work productivity	EUR / hour				
Romania		5,6	5,4	5,3	5,5
EU27 average		31,2	30,8	31,4	31,9
The energetic intensity	Kg.ec oil /				
Romania	1000 EUR /	412,2	386,8	393,0	392,1
EU27 average	gdp	151,6	150,0	152,0	144,3
The share of High Tech exports	% in total exports				
Romania		5,4	8,2	9,8	8,8
EU27 average		15,4	17,1	16,1	15,4

Source: Eurostat.

We find that Romania recorded significant gaps in other indicators of competitiveness, such as: labor productivity is below 1/5 of the EU average energy intensity is almost 3 times higher than the EU average, while the share of exports High - tech is below half the EU average.

Although Romanian governments granted fiscal facilities to certain areas of top activities (for example breaks tax contributions for employees and companies working in the IT field), the measures taken are not enough. The main measure is to reach 2% of GDP for research expenditure, accompanied by respect for the percentage of 6% of GDP for education, according the law of education no. 1/2011. To date, though governments have set a budget for each budget exercise less than 4% of GBP for education (2013 – 2,5%, 2014 – 3,2%, 2015 – 3,7%), while this percent is approximately 5% in countries from Western Europe. Poor R & D funding leads to long-term adverse outcomes. This can generate departure abroad of the employees for these areas high tech and decreasing competitiveness of these sectors.

The Europe 2020 Strategy sets out that an effective solution to end the crisis and to recover competitiveness gaps with the US, Japan or China, is investments in research and innovation.

Conclusions

There are several factors that adversely affect the perspective of the recovery of the economic competitiveness for Romania. A main part of this factors include: uncertainties of the business environment, budget constraints, reduced contribution of the entrepreneurship to the technological innovation and the low degree of absorption of the European funds.

This situation requires reconsideration of the role of research, development and innovation in the economic recovery. Specifically, it is necessary to ensure a homogeneous distribution of research and development expenses, eliminating as much as possible territorial discrepancies existing especially between Bucharest and the rest of counties.

Also, subsidiaries of transnational companies that operate in Romania must be involved in funding of research and development, especially on the side of technological innovation process.

In the current context, it must focus on cooperation between the business sector and academic sector and to ensure the clarification of concept of the smart specialization, concept which has to be adapted to the concrete situation of our country.

On medium and long term, including in the issue of future research in RDI, should be a strategic approach based on the need to ensure sustainable development. In this respect, it is important to integrate the National Strategy for Research, Development and Innovation within the overall strategy of economic and social development of our country. Integration should be made taking into account the operationalization of the European Research Area, of the Romania's competitive advantages and the increasing of degree of absorption of European funds.

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Correlations between use of renewable energy and living standards in Europe

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Abstract. *The paper investigates the relationship between the living standards of European population and its willingness to exploit renewable energy sources. Based on Eurostat data for the 2004-2014 period, which is a decade of intensified attempts to switch to unconventional resources, at European level, we outline the main trends in energy consumption, for EU 28, and we trace the main correlations between selected indicators of the living standard and indicators of renewable energy consumption. Clusters of nations are thus formed, depending on the identified patterns, and potential trends of evolution are outlined. Thus, indicators of economic development can become proxies for anticipating the consumption behaviors in energy sector, contributing to the advancement of the energy business domain.*

Keywords: living standards, Europe, renewable energy sources, unconventional resources, clusters

Literature review

Discussions whether renewable energy sources can sustain economic development have abounded in literature. Trainer (1995) concludes that only a decrease in the living standards, and a much lower allocation of energy per household can support society development in the future. On the contrary, Omer (2008) states that the extensive use of renewable energy will be a way to conserve biosystems, in the next decades. Martinot et al. (2002) address the problem of renewable energy in developing countries, with lower living standards. Kaygusuz (2002) refers to the particular case of Turkey, an energy importer and a heavy consumer, whose behaviors affect already the environment, and the situation is likely to worsen in the future. Celiktas and Kocar (2010) come back to this issue, which they examine using forecasting techniques. However, the cross-European studies examining the relation between renewable energy use and socio-economic indicators remain, for the time, scarce.

Methodology

We have selected two indicators of the living standards in present days Europe, based on the EU 28 Eurostat dataset, one objective, namely GDP per capita (gdp) and the other one subjective, satisfaction with the living conditions (satisf), and we have collected data for the 2004-2014 period.

We have also selected three indicators of the renewable energy consumption, namely: electricity generated from renewable energy sources (el_ren), resource productivity (res_prod), and electricity prices for household consumers (el_prc).

We have used Pearson correlations to outline the links between the considered variables, considering the following hypotheses:

H1: There is a strong positive correlation between the level of the GDP per capita and the amount of electricity generated from renewable energy sources and, respectively, the resource productivity.

H2: There is a strong negative correlation between price of electricity and life satisfaction as perceived by the consumers.

The descriptive statistics for the indicators of the living standard is presented in Table 1 below:

Table 1. *The indicators of the living standard*

Country	Average GDP per capita index, 2004-2014 (EU 28 = 100)	Average life satisfaction, 2004-2014 (1 to 10 scale)
BE	118.18	7.6
BG	42.55	4.8
CZ	82.00	6.9
DK	124.36	8.0
DE	118.45	7.3
EE	66.64	6.5
IE	136.73	7.4
EL	86.18	6.2
ES	97.64	6.9
FR	107.91	7.1
HR	59.64	6.3
IT	103.36	6.7
CY	96.55	6.2

Country	Average GDP per capita index, 2004-2014 (EU 28 = 100)	Average life satisfaction, 2004-2014 (1 to 10 scale)
LV	56.36	6.5
LT	62.00	6.7
LU	256.00	7.5
HU	64.00	6.1
MT	82.45	7.1
NL	134.82	7.8
AT	126.91	7.8
PL	58.45	7.3
PT	78.73	6.2
RO	46.36	7.2
SI	84.55	7.0
SK	69.18	7.0
FI	115.73	8.0
SE	125.64	8.0
UK	114.09	7.3

Source: Author's own processing.

It may be seen that the two measures, the objective and the subjective one, are uncorrelated, as countries with high GDP allocation per capita may have lower levels of subjectively perceived life satisfaction, as compared with poorer countries.

The descriptive statistics for the indicators of the renewable energy use in households is presented in Table 2 below:

Table 2. *The indicators of the renewable energy use*

Country	Average el_ren (% energy consumption)	Average res_prod (EUR/ kg of oil equiv)	Average el_prc (EUR/kwh)
BE	6.81	7.16	6.67
BG	11.93	12.24	11.72
CZ	3.10	6.00	0.16
DK	3.60	6.30	0.20
DE	4.60	6.10	0.19
EE	6.20	6.30	0.20
IE	7.10	6.00	0.21
EL	9.10	6.50	0.23
ES	11.30	6.80	0.22
FR	12.40	6.60	0.21
HR	13.40	7.10	0.21
IT	9.10	17.30	17.30
CY	9.30	2.30	2.30
LV	9.30	43.70	43.70
LT	9.40	6.70	6.70
LU	10.00	4.30	4.30
HU	11.30	5.20	5.20
MT	12.70	1.10	0.08
NL	12.90	1.20	0.08
AT	16.10	1.20	0.08
PL	18.90	1.30	0.09
PT	18.90	1.30	0.08

Country	Average el_ren (% energy consumption)	Average res_prod (EUR/ kg of oil equiv)	Average el_prc (EUR/kwh)
RO	3.60	1.30	0.09
SI	3.70	1.40	0.08
SK	4.00	1.50	0.09
FI	4.60	1.60	0.10
SE	5.20	1.60	0.11
UK	6.40	1.70	0.13

Source: Author's own processing.

The results of the hypothesis testing are presented below.

Results

We have tested the first hypothesis, as follows:

Table 3. *Model summary*

Model	R	R square	Adjusted R square	Std. error of the estimate
1	**0.872**	**0.712**	**0.624**	**122.62**

Source: Author's own processing.

Table 4. *ANOVA*

Model	Sum of squares	Df	Mean square	F	Sig.
1	11438608.89	1	11838609	6.1212	0.1233
Regression	3681205.867	2	1840553		
Residual	15219724.76	3			
Total					

Source: Author's own processing.

Table 5. *Regression model*

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.	95% Confidence interval	
	B	Std. error	Beta			Lower bound	Upper bound
1	2258.437	1081.997	0.136	2.087231		-2384.02	6723.897
(Constant)	0.167408	0.06600		2.536237	0.1233	-0.1133	0.452219
Nempl							

Source: Author's own processing.

[a]Predictors: (constant), GDP per capita
Coefficients

[a]Dependent variable: energy generated from renewable sources

It may be seen that, given the significance of the model, of above 0.05, the first hypothesis is rejected, and the alternate hypothesis is accepted. Namely, there is no positive correlation between the buying power in a given society and the energy generated from renewable sources. Thus, wealthier people are not necessarily oriented towards sustainable development behaviors.

We have also tested the second hypothesis.

Table 6. *Model summary*

Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.872	0.712	0.624	112.42

Source: Author's own processing.

Table 7. *ANOVA*

Model	Sum of squares	Df	Mean square	F	Sig.
1	11438608.89	1	11838609	6.1212	0.1233
Regression	3681205.867	2	1840553		
Residual	15219724.76	3			
Total					

Source: Author's own processing.

Table 8. *Regression model*

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.	95% confidence interval	
	B	Std. error	Beta			Lower bound	Upper bound
1	2258.437	1081.997	0.136	2.087231		-2384.02	6723.897
(Constant)	0.167408	0.06600		2.536237	0.0233	-0.1133	0.452219
Nempl							

Source: Author's own processing.

[a]Predictors: (constant), price of electricity

Coefficients

Dependent variable: life satisfaction

It may be seen that the second hypothesis is confirmed, price of energy being among the factors which contribute to a lower life satisfaction, when above a certain limit.

Conclusions

Our analysis has proven that there are potential correlations between indicators related to energy use or consumer attitude towards energy sources and general economic and social indicators, as life standards or life satisfaction. Thus, further attention is to be given to these relations of influence, by extending the list of indicators examined.

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Energy MBA - lessons of university-business sustainable partnerships

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Abstract. *The MBA programs is considered in this paper an example of partnership between university and business environment in the energy field. Our analysis is based on some successful examples in the MBA energy and provides a framework for debate and useful insights. The impact on teaching and learning of these programs, as well as the potential for innovation and sustainable growth in the industry provide some lessons for university- business strategic partnerships and useful conclusions for this study. In addition, insights and reflections are offered in terms of sustainability for management education in the energy field.*

Keywords: university, partnership, energy management, sustainability

Introduction

The European Union has set an energy/environmental strategy in this sense, leading to increased efforts of using sources of clean or renewable energy. The action is called the '2020 Energy Strategy' and, in short, "By 2020, the EU aims to reduce its greenhouse gas emissions by at least 20%, increase the share of renewable energy to at least 20% of consumption, and achieve energy savings of 20% or more" (The European Commission, 2016).

Today it is accepted that the model of energy production based on fossil fuels, which has contributed so much to economic and social development, faces economic, environmental and supplying issues, requiring alternative solutions to maintain the development (Escuela de organisación industrial, 2015). A rigorous academic approach in this sense would enable people with previous experience in the field to gain "highly valued industry insight, including an overview of contemporary issues in the market" (London School of Business and Finance, 2015).

Universities and business environment have been collaborating for long time ago, but the new challenges of knowledge economy has strengthen the need for sustainable partnerships that go beyond the traditional research projects. Creating more strategic industry-university partnerships would substantially improve Europe's climate for innovation (Edmondson, 2012).

One of the newest dimensions of the university-business partnership is the development of MBA programs in energy or energy management. Programs designed to train people in the field of energy create an opportunity to learn more about this challenging industry and safety environment but also to develop managerial skills in energy business. The general issues in international management combined with special features of this particular industry provide a sustainable background for individuals pursuing a career in energy field.

MBA Green Energy and Sustainable Business in Bologna Business School, Global Energy MBA in Warwick Business School, MBA in Energy and Sustainable Development Management in Paris IPAG Business School, Professional MBA Energy Management in Wien Wu Executive Academy are few examples of successful collaborations for training in energy at the highest academic level and provide a sustainable instrument for individuals to better manage their careers.

Focusing on energy management, these MBAs instruct and train people on how to apply management theories to energy, or energy trading, how to interpret competition law for energy companies or to understand the global energy markets. Through analysis of renewable sources of energy or alternative energy, correlations between energy intensity and economic growth or challenges to enforce energy/environmental legislation and leadership issues in energy industry, people learn more about the energy along with preserving the environment.

Short description

The general MBA program in energy management targets the issues of oil and gas management, it is spread over 2 to 5 semesters, in the course of 1 to 3 years, and it is paid in full by the student or a supporting company (commonly, the employer), with tuition taxes ranging from 4,000 euros (at the Bucharest University of Economic Studies) to close to 50,000 euro (at Warwick Business School). It generally has a full-time schedule, delivering on campus and admitting students already having between 2 and 7 years of professional experience or senior managerial positions in the field or in adjacent fields. The students come from various parts of the world, they must fulfil strict pre-requisites, and the programme is taught in English. Also the lecturers have a rich

experience with the topics and they typically work for, or have worked for, local and international market stakeholders - be they players in the energy sector or governmental agencies. The programme provides introductory courses on topics such as accounting, economics, statistics, management, and more, and it is highly focused on the practical aspects of the subjects. On that note, all programmes use a very high number of practical tools such as: company visits, compulsory or optional internship periods, case studies, projects, open sessions with guests from companies and so on. Other areas of focus are renewable energy management, sustainable entrepreneurship in the field, energy markets and many more.

From this pattern, the programmes differentiate themselves with characteristics such as focusing on renewable sources of energy or entrepreneurship in the field, delivering part of the programme (a semester or more) in another country (Vienna University of Economic Studies), providing the students with a part-time schedule, and extension of programme duration (IPAG Business School), using unique mixes of on campus and online teaching (Warwick Business School, n. d.) or even distance learning (Beuth University of Applied Sciences and RENAC, n. d., Middlesex University, n. d.) , offering the possibility of benefiting from scholarships, or other methods for tuition fee reduction (usually for exceptional students), making use of a career planning department, offering the option of double qualification (London School of Business and Finance, 2015), and actively trying to accommodate young students, within the specialization field (Coventry University, n.d.). Annex 1 presents more detailed examples.

Cost efficiency

As stated in the beginning, the very dynamics of economic development, leading to ever increasing demand of energy at a global level, is the main trigger for considering a career in the field of energy. In reality, most of the programmes lead to a triple-win situation: they attract more students because of the economic environment (fully paying for their tuition fees-either themselves or their employees); in turn, the students are being offered a highly practical teaching process, with an extraordinary abundance of exposure to the realities of the sector; while the companies receive highly skilled employees at the end of the process. In the end, such programmes seem to have found the right path towards Cavico and Mujtaba's "leading edge of change" (Cavico and Mujtaba, 2010). This could explain how such specializations are more and more sought despite the fees that start from €9,000 (for some very few part-time programmes) and range all the way to over €45,000 - tuition fees only, for the entire programme. And this applies to Europe alone. To sum up, despite the relatively high fees, such programmes promise bright careers with handsomely paid managerial positions, in a continuously developing and changing sector.

Teaching, learning and sustainability

Few of these programmes bring innovation compared to other types of programmes. Instead, they make use of what are perceived as being modern teaching and learning methods, such as practical illustration of theory in practice, blended learning tools, mobile and even full online course delivery. The most used of these is the theory and practice approach, and the results it brings are of the highest importance. The business environment becomes an active partner in the teaching and learning process, not just a bystander that is observed from time to time. If, in most other cases, the involvement of the business environment in this process is a response to initiatives coming from the

University, in this case businesses bring more than just introducing guest speakers: they take part in project works and master lectures; they organise in-company visit; they sponsor various tracks, hosting internships for students and providing professional opportunities for graduate students (Bologna Business School, n.d.). It is this continuous communication and exchange of information, what keeps these MBA programs informed with the newest events in the field. At the same time, the students graduate these programs with the proper mind-set and skills in order take competitive actions in their companies, but following the perspective proposed by Willard (2004) for a healthy planet through a triple-win proposition (companies, the environment and the society). In order to achieve this, these MBA programmes take sustainability as active component in the curriculum with the corresponding electives becoming more and more popular, a feat also observed in other world regions, where it is even increasingly embedded into general business management courses, such as India (Park et all., 2012).

Economic partnerships

In the context of such highly practical attitude, the partnerships that the Universities have established with companies within the field represent a crucial issue. In parallel, the Universities must maintain their programmes up to date, as an essential criterion. If we use Cavico and Mujtaba's view, which is that "*A school must aggressively search out and identify market opportunities, and then seek to secure a differential competitive advantage in markets where it deems it can be successful." (Cavico and Mujtaba, 2010),* we would find in fact that as far as what the Energy field is concerned, nowadays there seem to be more opportunities than ever. Regarding MBA programmes in the field, they would represent a big challenge for Universities, unless a continuous exchange of information took place with the market environment itself. That is why, most of these programmes collaborate with many relevant companies for various actions, such as in-company visits, case study preparation, internship hosting and more. Not only are the students exposed to the practical and real issues, they are also given the variety needed to understand the larger, global picture. In this sense, one should mention the close connection between accelerating the global transition towards the green economy and the introduction of sustainability within general business management courses (Park et al., 2012).

Innovation and society

The variety of perspectives acknowledged throughout the programme, the intercultural exchanges, the background of both students and teachers, and more, all these contribute to a new, adaptive way of thinking for the students who, having developed the much-needed skills right off their MBA, are ready for both leading and executive positions in the field or adjacent fields. For example, if we take Cavico and Mujtaba's perspective, and consider that "*the keys to sustainability and growth are innovation and entrepreneurship […]" (Cavico and Mujtaba, 2010),* even as energy entrepreneurs, the graduates in question are prepared to successfully take on the challenges. They are aware of the dynamics of their sector and they are ready to take innovative and sustainable actions on the benefit of all parties involved.

Conclusions

From the perspective of students, we may conclude that taking a bet by means of an MBA programme and obtaining a degree in the energy field is a bet that will provide a massive win, leading to a successful future career. As high as it generally is, this investment usually pays off mostly because of the prominent role one would reach in

this important sector and because of its continuous growth. Obviously, there are significant challenges to lead to major developments for all of society.

Even if there are a number of important institutional and cultural factors to consider, the driver to better integration of sustainability into management education is the need for a stronger scholarly foundation and the need to reflect the local conditions as well as the global trends in terms of business, government, and societal reality (Park et al., 2012).

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ANNEX 1

No.	Name of Program	Resident University	Total Tuition Fees (Euro)	Delivery Method	Other	Link
1	MBA Green Energy and Sustainable Businesses	Bologna Business School, University of Bologna (Italy)	27,000	- on campus, - 3 semesters + internship, - full-time		http://www.bbs.unibo.it/hp/en/global-mba/mba-green-energy-and-sustainable-businesses/#presentazione
2	Global MBA (Oil, Gas and Energy Management)	London School of Business and Finance (UK)	12,000	- on campus + online, - 4 semesters, - full-time	- possibility of gaining a double qualification (e.g. ACCA, CIMA or CFA)	http://www.lsbf.org.uk/programmes/postgraduate/mba/global/specialisation/oil-gas-energy-management
3	Professional MBA Energy Management	Vienna University of Economic Studies (Austria)	45,000	- on campus, - 15 months, - part-time	- mandatory international residency during programme	https://www.executiveacademy.at/en/mba/professional-MBA/energy-management/Pages/fact-sheet.aspx
4	MBA in Business Administration: Oil, Gas and Energy Management	University of Nicosia, School of Business (Cyprus)	11,800	- on campus, - 3 semesters, - full-time/part-time		http://www.unic.ac.cy/master-degrees/business-administration-oil-gas-and-energy-management-mba-15-years-or-3-semesters-0
5	Master in Renewable Energy and the Energy Market	Escuela de Organisacion Industrial (Spain)	14,070	- on campus, - 2 semesters, - full-time,	- focusing on the EU 2020 Energy Strategy - 750 practice hours (not compulsory)	http://www.eoi.es/portal/en/master-renovable-energy-market-madrid-essentials
6	MBA Renewables	Beuth University of Applied Sciences Berlin jointly with Renewables Academy (RENAC) (Germany)	14,000	- distance learning, - 5 semesters (2.5 years) - part-time	- on-campus practical training module	http://www.mba-renewables.de/home.html
7	Master Of Business Administration (specialization	Wildau Institute of Technology (Germany)	11,800	- on campus, - 4 semesters,	- taught in German (75%) and English (25%)	http://www.wit-wildau.de/#!mba-general/c34r

No.	Name of Program	Resident University	Total Tuition Fees (Euro)	Delivery Method	Other	Link
	in Energy and Infrastructure Management)			- part-time	- 9 intensive courses per week and some week-end workshops - e-learning module	
8	Energy MBA	Bucharest University of Economic Studies (Romania)	4,000	- on campus, - 4 semesters, - part-time		http://mba-energie.ase.ro/
9	Global Energy MBA	Warwick Business School (UK)	48,000	- on campus+on line - 3 years	- some modules delivered at international locations	http://www.wbs.ac.uk/courses/mba/global-energy/
10	MBA in Oil and Gas	Middlesex University London (UK)	20,000	- on line, - distance learning, - 4 semesters		http://www.mdx.ac.uk/courses/postgraduate/master-of-business-administration-in-oil-and-gas
11	Oil and Gas Management MBA	Coventry University (UK)	20,000	- on campus, - 2 semesters (1 year), - full-time		http://www.coventry.ac.uk/course-structure/2013/culc/postgraduate/oil-and-gas-management-mba/
12	MBA in Oil and Gas Management	Aberdeen Business School (UK)	26,000	- on campus, - 3 semesters, - full-time	- experience in the field is compulsory	http://www.rgu.ac.uk/business-management-and-accounting/study-options/mba-degrees/mba-oil-and-gas-management
13	MBA in Energy and Sustainable Development Management	IPAG Business School (France)	9,000	- on campus, - 2 semesters, - full-time		http://www.ipag.fr/en/programmes/mba/energy-and-sustainable-development-management-mba/

Source: Authors' own research.

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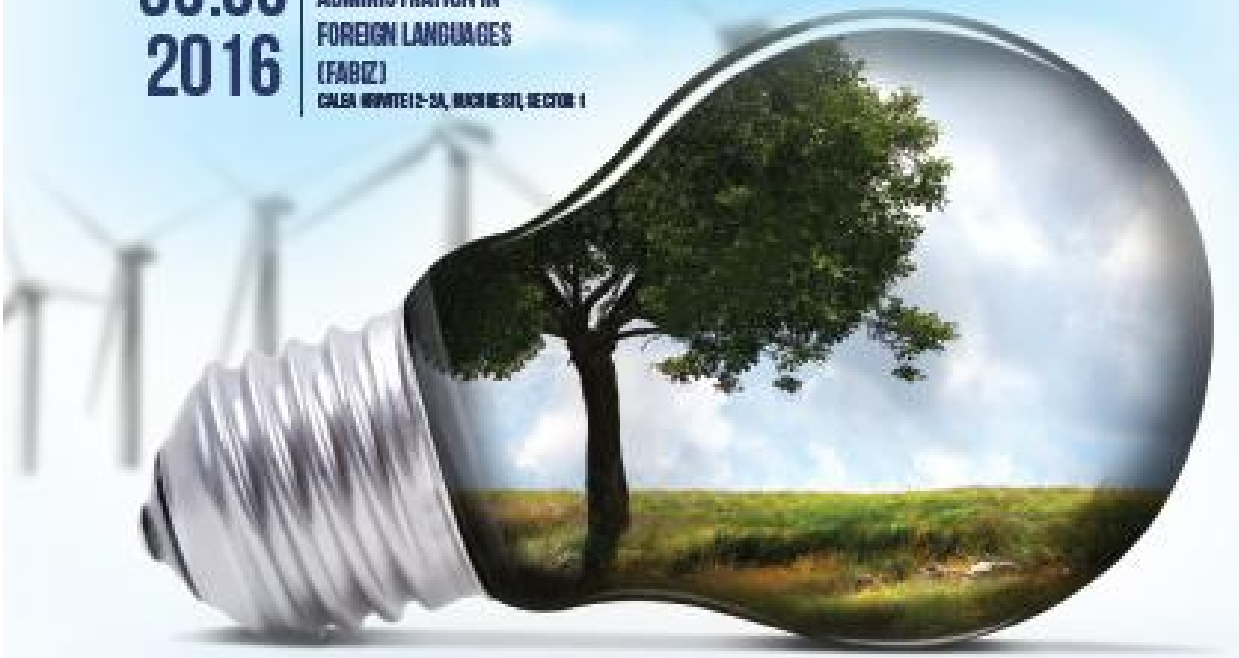

Entrepreneurship and Business Administration in Energy

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