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ANALYSIS OF ENERGY COSTS IN RETAIL TRADE

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Abstract
Energy costs are significant determinant of the performance of total economy, all sectors, including trade and individual enterprises. Due to that, they are lately more analyzed in the context of sustainable development and the impact on the performance of the economy, sectors and enterprises. The use of renewable energy is an important factor in energy costs reducing and increasing of profitability. Under the influence of specific factors it varies in individual economies (countries), sectors and companies. Having this as a starting point, our article specially investigates the problem of energy efficiency in trade sector. This is due to considerable economic impact of trade on total energy consumption in economy and especially service sector (share in gross domestic product and the number of employees). The research on many global retail companies find, and also confirmed in this study, that the increase of energy efficiency can significantly improve the profitability of the trade sector. This is particularly achieved with as increased use of renewable energy in total final energy consumption in the trade sector. JEL classification: Q40, Q44, Q32, Q57
Keywords: energy intensity, renewable energy, energy management, green energy, final energy consumption

1. INTRODUCTION

Energy costs are lately considered as very significant determinant of performance at all organizational levels (country, sector, company, product category). Accordingly, this paper examines the impact of efficient energy costs management on the performance of the trade sector, trading enterprises, shops and product categories. Extensive literature is written on the subject of energy efficiency. Despite this, insufficient literature is devoted to the determinants of efficient energy costs management in the trade sector, particularly in Serbia, which is the focus of research in this paper (Lukic, 2011, 2012, 2013, 2014, 2015a, b, c, d. 22016a,b). The aim of this work is to study the specifics, factors and measures for efficient energy costs management in comparable countries in order to increase profitability of the trade sector. Knowledge of general and specific problems of managing energy costs is fundamental prerequisite for their reduction in trade companies.

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In the context of primary research hypotheses - energy costs are a key determinant of profitability, we point to the importance of energy costs and ways of their reduction in order to increase the profitability of trade enterprises. The stress is put on the effects of sustainable, "green" energy in trade.

The basic methodology of research is based on a comparative analysis of energy costs of trade in some global regions, countries, companies, types of stores and product categories. This way of research provides complete information for improving management of energy costs efficiency in trade at all organizational levels, particularly at the enterprise level, store and product category.

For the purposes of writing this paper we gathered empirical data from different comparable sources. On the basis of them we carried out appropriate statistical and mathematical calculations in accordance with the purpose and character of this study.

The limitation of the research on the effect of efficient energy costs management on profitability in the trade sector is reflected in the fact they have not yet developed statistics on energy costs in trade at all organizational levels of research (country, sub-sectors of trade, enterprise, types of stores and product categories), and the data are not fully comparable due to the different sources of collection. Nevertheless, the contribution of this work is reflected in the fact that it provides the theoretical, methodological and empirical basis for further investigation of these issues and promotion (with development and implementation of appropriate programs) of effectiveness of energy costs management the in particular trade company. This especially applies to trading companies from Serbia in which the level of energy costs efficiency management is low compared to developed countries.

The significance and factors of size and structure of energy costs in trade

Energy costs are very significant economic category in trade. They greatly affect the profit in trade, what is indicated by numerous studies and available empirical data. Every year $ 20 billion of energy is spent in retail. Based on this energy consumption, and with increase of energy efficiency (replacement of existing technology with new and implementation of other energy programs) up to 15% or $ 3 billion of energy could be saved in retail annually (Jamieson, 2014). The energy is a significant component of operating costs in retail. Reducing energy costs in retail for 10% equals increased sales by 8% per square meter. By applying appropriate programs for efficient energy management and the best sustainable practices, profitability in retail can be greatly increased as a consequence of the reduction of energy costs (10 - 30%) (Jamieson, 2013). All in all, efficient energy management significantly increases the yield of investments in retail.

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According to a study conducted by the US Department of Energy's Pacific Northwest National Laboratory, between 10 and 20% energy can be saved in existing commercial buildings. The United States Environmental Protection Agency report "Sector Collaborative on Energy Efficiency Accomplishments and Next Steps" identifies potential savings in supermarkets up to 21% and in conventional stores up to 41%. In general, energy reduction can be up to 30% with more efficient energy management in retail. The reduction of operating costs reflects positively on profit, taking into account the fact that energy costs participate in total operating costs in retail with about 5.5%. As it is generally known, retailers usually operate at a 4% profit margin, so the reduction of energy consumption by 15% increases profit margin from 4% to 4.7%, which represents an 18.7% increase (Jamieson, 2014).

As shown by the available empirical data energy costs are significant component of operating costs in retail. In terms of structure, energy costs differ in the retail of food and non-food goods. In food retail, 82% of total energy consumption is related to electricity and 18% to natural gas / other liquid fuels; average energy consumption per square meter of sales area is 51.3 kWh. In food retail, structure of energy consumption is: refrigeration 48%, lighting 18%, heating, ventilation and air-conditioning 20% and others 14%. Unlike food, the structure of energy consumption in the non-food retail sales is as follows: lighting 50%, heating, cooling and air-conditioning 40% and others 10%. Given the need for refrigeration, heating, ventilation and air-conditioning, food retailers, therefore, consume three times more energy for these purposes than non-food retailers (Jamieson, 2014). Accordingly, in order to reduce operational costs and increase profitability in food retail, the focus of analysis of energy efficiency should be energy costs categories in food retailing. Product category is a significant determinant of the size and structure of energy costs in retail. In addition to the categories of products, the size and structure of energy costs in trade is affected by numerous specific controlled and "uncontrolled" factors to which we shall closely look further.

Global climate changes affect the cost of energy in all sectors, including trade. Thus, for example, warming of 1° C (1.8 ° F) requires cooling, which increases energy costs by about 5-20% (Jamieson, 2014). Increasing energy efficiency in retail reduces the risk of increasing energy costs. It has a positive impact on operating costs and profits in retail.

The size of the store also significantly affects energy costs in retail. According to one study, energy consumption per individual store is as follows: small retail facilities up to 5000 m2 - $1.42 /m2, medium size to 50,000 m2 - $ 0.90 /m2, and large – more than 50,000 m2 - $ are 1.40 / m2 (Jamieson, 2014). High energy consumption in small and "big-box" facilities is very attractive for reduction, in the context of energy management. Specialized strategies must be implemented to control energy consumption in

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stores that typically manage energy costs only 30-40%. In "big-box" stores the largest part of the energy consumption is related to lighting and refrigeration (over 50%). In small stores, the control of energy consumption must be much more efficient than in large where, in particular, systems for lighting and heating, ventilation and air-conditioning must be controlled. Due to the limitations of the system of efficient control of energy consumption in small stores the potential reduction is between 3-10%. Given the high level of effective controls in large stores the energy consumption can be reduced by 20-30%, depending on the initiative of replacing the existing with new energy efficient equipment, and age of building (Jamieson, 2014).

Size, age and location of the building are very important factors of energy costs in retail. Small objects have high cost of energy per square meter. Age affects energy costs, and facilities built after 1960 are energy inefficient. Location of store is one of the important factors of energy costs in retail. As to illustrate, according to one study, energy consumption in existing retail facilities varies geographically: 37.8 Miami, 50.4 Seattle and 79.2 Chicago (thousand Btu per sq/ft) (Jamieson, 2014).

Trade companies increasingly apply the concept of sustainable development in their business in order to improve performance. Its application differs among specific retail formats (stores). Generally speaking, it is considerably higher in hypermarkets than in traditional stores (Vijayan, 2014). Leading retailers aim at reducing costs and increasing brand loyalty. So-called sustained efforts lead to a reduction of costs, risks, and increase brand loyalty. Sustainable brands are highly acceptable in the market and significantly affect an increase in sales (Jamieson, 2013).

In the context of the application of the concept of sustainable development in trade great importance is paid to the use of renewable energy, so-called green energy. The costs of using traditional and sustainable energy sources are different. However, due to this, optimizing the structure of energy sources can greatly affect the amount of total energy costs as a factor of performance in trade.

The structure of energy costs depend on the type of retail business, i.e. product categories. Average energy consumption in the retail (in kWh / m2 / year) is: non-food retailers 167-500, food retailers 695-945 and shopping centers 333-390. The structure of energy consumption in the non-food retail (i.e. clothing store) (in %) is as follows: heating, ventilation and air-conditioning 50%, lighting 40% and other 10%. In the food retail (supermarket) energy consumption structure (in %) is as follows: refrigeration 50%, heating, ventilation and air-conditioning 25%, lighting 15%, and food processing/office 10% (Resource efficiency for the Retail Sector, Green Business, Clean Technology Centre, Cork Institute of Technology, 2014, http://greenbusiness.ie/wp-content/uploads/2012/11/Retail-Guide-NEW-Web-version.pdf). In non-food retail stores primary categories of energy costs are lighting, and heating, ventilation and air-

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conditioning. In food retail stores most of the energy costs refers to refrigeration. Energy costs are determinant of food prices. The study revealed that those have moderate influence on price in food retail (Charlebois, 2014).

Energy and sustainable objectives of the leading retailers, with best practices, are as follows: monitoring of internal indicators (energy, resources, loss, coordination with suppliers); improving of communication by intensification of efforts through the website, Internet and social networks; internal reporting on indicators of sustainable development, with tendency to external reporting; focusing on the reduction of energy consumption; development of multi-annual strategic planning and identifying strategic objective; and identifying risks in the supply chain, tracking and reports on energy suppliers (Jamieson, 2013).

All in all, energy costs are significant determinant of performance in retail. So, for example, according to estimates of the Carbon Trust, reduction of energy costs by 20% results in an increase in sales of 5% in retail (Quoted in: 25-in-5: BRC launches new initiative to stimulate retailers' energy efficiency, http://www.edie.net/news/6/BRC-initiative-launched-to-stimulate-energy-efficiency-in-retail-sector/). Numerous factors influence the cost of energy in the retail market. Their effective control can significantly reduce energy costs and thus increase profits in retail. Considerable energy savings in the retail are accomplished by improving the structure of building in terms of energy efficiency, increased use of modern energy efficient technologies, and development and implementation of special programs for more efficient energy consumption. All employees, business partners and consumers should be familiar with the effects of the concept of energy management (especially in the context of "green"), because far greater energy savings are then achieved. Fact that should be borne in mind that reduction of energy costs by 10%, as well as margin, causes an increase in sales for 8% per square meter (Jamieson, 2013).

There are basically two ways of reduction of energy costs. These are: the reduction of the cost of electricity, gas and other fuels and/or reducing the amount of energy consumption. Reduction of energy prices are established by the development of competitive price, avoiding the payment of penalties, and changes in types of energy use. Reduction in the amount of energy consumption is achieved by identifying energy users, increasing conscientiousness of staff regarding energy consumption and more efficient energy management with direct beneficiaries.

2. THE ENERGY COST IN TRADE OF SELECTED COUNTRIES

Energy costs are influenced by different factors specific to trade in individual countries. In this article we will look at energy costs in the sale of major countries, with special emphasis on Serbia.

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The energy costs in trade of the United States

As it is known, the use of renewable energy sources can significantly reduce the total cost of energy. The share of renewable energy in the net energy production in the world is about 10%, while the United States is 8%. The costs of other energy sources are different. Thus, for example, the cost of individual sources of energy ($ / kW-hr) in the United States in 2015 were: coal $ 0.10 to 0.14, natural gas $ 0.07-0.13, nuclear $ 0.10, wind - $ 0.08-0.20, solar PV $ 0.13, solar thermal $ 0.24, geothermal $ 0.05, biomass $ 0.10, and hydro $ 0.08 (Renewable Energy Sources: Cost Comparison, www.renewable-energysources.com/). Given the different prices, optimizing the use of resources, significant reductions in the cost of energy can be achieved in all sectors, including trade.

In the United States retail participate in total energy consumption with about 13%. In this respect, it is the second largest (Advanced Energy Retrofit Guide: Retail Buildings, Pacific Northwest National Laboratory, US Department of Energy, http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20814.pdf). (July 16,2016)

On average, retail outlets consume 14 kilowatt-hours (kWh) of electricity and 31 cubic meters of natural gas per square meter in the United States, annually. In other words, retail stores annually consume $ 1.21 of electricity per square meter, and 14 cents of natural gas per square meter in the United States on average (Managing Energy Costs in Retail buildings; https://www.nationalgridus.com/non_html/shared_energyeff_retail.pdf). The percentage structure of electricity use in retail in the United States is as follows: lighting 53%, cooling 13%, refrigeration 9%, ventilation 8%, heating 3%, computer equipment 1%, office equipment 1%, water heating 1% and other 11 % (US Energy Information Administration. According to: Managing Energy Costs in Retail Buildings; Published on Business Energy Advisor, https://bizenergyadvisor.com). (July 16,2016) In typical retail stores in the United States 69 % to 84% of total energy consumption is spent on lighting, refrigeration and heating, depending on climate zone and systems applied to achieve the highest energy savings (Managing Energy Costs in Retail buildings, https://www.nationalgridus.com/non_html/shared_energyeff_retail.pdf). More than one-half of total electricity consumption is spent on lighting. The implementation of effective systems for lighting, refrigeration and heating contributes significantly to energy savings in retail stores.

The percentage structure of natural gas consumption in retail stores in the United States is as follows: heating 91%, cooking 3%, water heating 3% and other 3% (US Energy Information Administration. According to: Managing Energy Costs in Retail Buildings; Published on Business Energy Advisor

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https://bizenergyadvisor.com). Natural gas is, therefore, mostly used for space heating in the United States.

In retail, electricity consumption for certain purposes (lighting, cooling and ventilation) differs during 24-hour business operations. It is clearly seen in Figure 1 that the consumption of electricity for cooling is highest in mid-day.

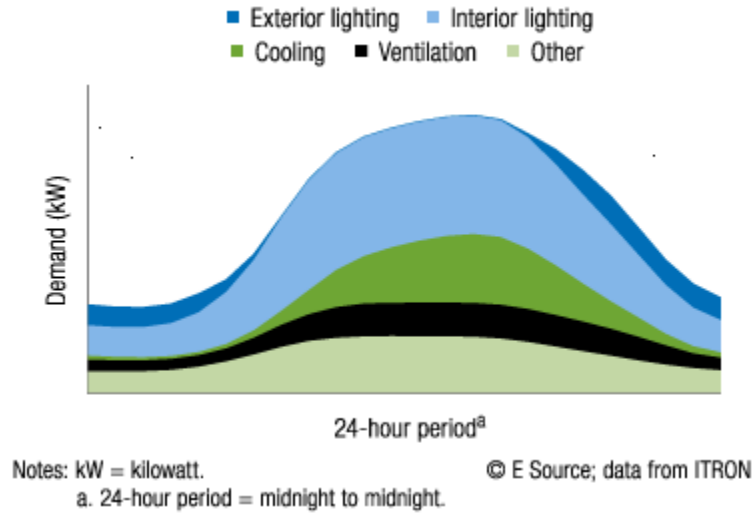

FIGURE 1 - CONSUMPTION OF ELECTRICITY IN RETAIL STORES DURING THE 24-HOUR BUSINESS OPERATIONS
Source: Managing Energy Costs in Retail Buildings; Published on Business Energy Advisor (https://bizenergyadvisor.com). (July 16,2016)

Energy costs are a significant factor in the cost efficiency and performance in trade of the United States. They are different in certain sectors of trade - wholesale and retail trade, stores and product categories, as shown by the data in Table 1.

In the wholesale trade in the United States electricity costs participated in total operating costs in 2012 with 0.9% and fuel costs 0.4%. Energy costs are higher in non-durable goods wholesale trade than durable. It is quite logical considering differences in the nature of their business.

Electricity costs are involved in the total operating costs by 2.5% and fuels 0.2% in the retail trade in the United States in 2012. Given the differences in the nature of business, energy costs in the United States are, therefore, higher in retail than in wholesale. Within the retail trade in the United States there are significant differences in the cost of energy observed by certain types of stores and product categories. As to illustrate this, the cost of electricity in 2012 ranged from 4.5% (gas station) to 0.9% (non-store retailers - online sales). That same year, fuel costs have ranged from 0.1% (health and personal care stores, clothing stores and fashion accessories, general merchandise stores) to 0.5% (building materials, garden equipment, suppliers and dealers), or to 0.7% (accommodation and food). All this leads to a general conclusion: that energy costs are higher among food retailers than non-food goods.

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TABLE 1- ENERGY COSTS IN TRADE BY SECTOR, STORES AND PRODUCT CATEGORIES IN THE UNITED STATES, 2012

	Cost of electricity (in % of total operating expenses)	Fuel costs (as % of total operating expenses)
Wholesale	0,9	0,4
Durable goods	0,8	0,4
Nondurable goods	1,0	0,5
Retail	2,5	0,2
Motor vehicles and parts dealers	1,8	0,4
Furniture and home furnishing stores	2,2	0,3
Electronics and appliances stores	1,5	0,2
Building material, garden equipment, suppliers and dealers	2,2	0,5
Food and beverage stores	4,2	0,3
Health and personal care stores	s	0,1
Gas stations	4,5	0,3
Clothing and clothing accessories stores	1,9	0,1
Sporting goods, hobby, book and music stores	2,3	0,2
General merchandise stores	3,1	0,1
Miscellaneous store retailers	2,4	0,3
Non-store retailers	0,9	0,2
Accommodation and food services, total	3,1	0,7
Accommodation services	3,2	0,7
Food and beverage services	3,0	0,6

Source: U.S. Census Bureau

By improving energy efficiency in existing retail stores energy costs can be significantly reduced. In the retail sales in the United States of America energy costs are after labor costs, rents and marketing significant component of total operating costs. Thus, for example, in a typical hypermarket, energy costs are $ 500,000 per year. Energy costs differ among retail formats (types of stores), and range 4 - 9% of the total operating costs. Differences in the energy cost of similar stores are up to 40%. These differences are determined by the age, type of goods and the size of the store. Energy costs may be reduced up to 20-30% by increasing energy efficiency, moreover, sometimes up to 50% (Turning down the cost of utilities and retail, McKinsey & Company, http://www.mckinsey.com/insights/consumer_and_retail/turning_down_the_cost_of_utilities_in_retail). (July 16, 2016)

In the United States, energy costs in retail stores of 50,000 square meters, amount to about $ 90,000. Improvement of the energy efficiency of a retail outlet and investment in new so-called "green energy systems" affect the improvement of consumer comfort, better lighting, which in turn reflects positively on increasing sales and return on investment as a result of the "green" image. In retail outlets, 70% of energy is used for lighting and heating, what represents a source for energy savings. (Managing energy costs in retail buildings, https://www.mge.com/images/PDF/Brochures/business/ManagingEnergyCostsInRetail

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Buildings.pdf). The structure of energy costs varies by individual retail formats (types of stores). In the United States consumption of electricity and natural gas differs in grocery shops. According to a study the structure of energy consumption in food shops is as follows: A. Electricity: lighting 53%, cooling 11%, refrigeration 10%, ventilation 8%, space heating 3%, water heating 2%, office equipment 2 % computer 2% and other 10%; and B. Natural gas: space heating 91%, water heating 3%, cooking 3% and other 2% (US Energy Information Administration; by: Managing energy costs in retail buildings, https://www.mge.com/images/PDF/Brochures/business/ManagingEnergyCostsInRetailBuildings.pdf). (July 16, 2016). In the United States the structure of energy consumption in supermarkets is specific. The typical structure of electricity in supermarkets (33,000 square meters of sales area) is as follows: cooling 60%, lighting 18%, heating, ventilation and air-conditioning 15%, water heating 2%, bakery 1% and other 4%. In supermarkets, the average consumption of electricity is 50 kWh per square meter (and in medium-sized supermarkets kWh 57 per square meter), and 50 cubic meters of natural gas per square meter annually. The highest energy consumption in supermarkets is used for refrigeration, heating, ventilation and air-conditioning; and natural gas is mainly used for heating (Schönberger, 2013).

Energy costs of trade in Australia

In Australia, energy costs and services are less than 5% of total operating costs for majority of retailers. Energy costs of beverage retailers, supermarket, iron goods shop and food shop range between 5 – 10% of total operating costs. Given the significant increase in recent years, the price of energy is an important factor of the retail sales costs in Australia (Australian Government, Productivity Commission, September 2014, Relative Costs of Doing Business in Australia: Retail Trade. Productivity Commission Research Report). According to estimates, the retail sector will participate in the total carbon dioxide emissions in Australia in 2020 with 2.52%. In retail sector, carbon dioxide emissions are in relation to energy consumption for heating, cooking, lighting and appliances. Energy consumption includes gas, wood, fuel, electricity. According to estimates the percentage structure of energy use in commercial buildings in Australia in 2020 (in % of the total) will be as follows: retail 28%, offices 20%, education 11%, wholesale 6% and municipalities 8%, accommodation/service 8%, health 7%, food service 6% and other 6%. Retail and wholesale in Australia, therefore, will participate in total energy consumption in the commercial sector in 2020 with 34%.

According to estimates for 2020, the structure of energy consumption in retail in Australia will look like this: heating, ventilation and air-conditioning 37%, lighting 23%, refrigeration 16%, appliances 9%, electronics 7%, water heating 6% and cooking 2%. The expected savings in the non-food retail in Australia in 2020 will be the following: energy waste reduction 10%, cooking 12%, refrigeration 13%, appliances

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15%, insulation 16%, heating, ventilation and air-conditioning 16%, lighting 17%, HVAC positive interaction 20%, electronics 37% and water heating 48%. The expected savings in food retailing in Australia in 2020 are as follows: heating, ventilation and air-conditioning 3%, cooking 4%, energy waste reduction 10%, refrigeration 13%, appliances 15%, lighting 16%, HVAC positive interaction 20%, insulation 21%, electronics 37%, and water heating 45% (Climate Works Australia, Low Carbon Growth Plan for Australia, Retail Sector Summary Report, June 2011, http://climateworks.com.au/sites/default/files/documents/publications/climateworks_lcgp_australia_retail_sector_summary_june2011_0.pdf). It will definitely have a positive impact on the future performance of retail sales in Australia.

Energy costs of trade in Singapore

In order to have thorough empirical analysis of the issue in this paper Table 2 shows the participation of wholesale and retail trade in electricity consumption in total economy, commercial and service sectors in Singapore for the period 2005 - 2014.

TABLE 2- THE SHARE OF WHOLESALE AND RETAIL IN THE TOTAL CONSUMPTION OF ELECTRICITY IN ECONOMY, COMMERCIAL AND SERVICE SECTORS IN SINGAPORE, 2005 - 2014.(UNIT: GMH)

	2005	2010	2011	2012	2013	2014
Overall economy	35,489,3	42,251,7	43,007,1	44,200,7	44,923,0	46,403,0
Commerce and service-related	12,640,7	15,163,9	15,714,6	16,134,7	16,605,6	16,954,3
The percentage share of wholesale and retail in total consumption of electricity of total economy, (%)*	6,35	5,01	4,91	4,61	4,42	4,77
The percentage share of wholesale and retail trade in the total consumption of electricity in the commercial and services sector, (%)*	17,22	13,97	13,14	12,65	11,96	11,71

Note: * Calculation performed by the author

Source: Singapore Energy Statistics 2015 (https://www.ema.gov.sg/cmsmedia/Publications_and_Statistics/Publications/SES2015_Final_website_2mb.pdf) (July 16, 2016)

In Singapore, share of wholesale and retail trade in the total electricity consumption of the total economy is moving from 4.77 to 6.35%, and the total consumption of electricity in the commercial and service sectors between 11.71 to 17.22%. Dynamically speaking, gradual reduction in share of wholesale and

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retail trade in the total consumption of electricity in Singapore is obvious. This, in other words, means that energy efficiency in the wholesale and retail trade in Singapore increased. This is due to the implementation of relevant programs and measures to increase energy efficiency in the retail sector in Singapore.

Energy costs in trade of the European Union

Reduction of energy consumption by 20% results in an increase in sales of 5%. Due to this, and in the context of climate change, the European Union's goal sets targets of a 40% reduction in greenhouse gas emissions and increase energy efficiency by 27% until 2030, (Energy Efficiency Shows Its Worth for Retail Property, https://www.gresb.com/insights/2015/08/energy-efficiency-shows-its-worth-for-retail-property/). This will have a positive impact on the performance of all the companies.

The concept of sustainable development in all sectors is being intensively more and more applied in the European Union. In this context, great importance is given to the use of renewable energy, so-called “green energy". Different costs of some energy sources have an impact on overall energy costs. By optimizing the structure of energy sources, total energy costs, as a factor in the performance of all enterprises can, therefore, be affected. The percentage share of renewed energy in total energy consumption by individual selected countries in the European Union in 2013 looked like this: The European Union (EU-28) 11.8%, Denmark 24.2%, Germany 10.3%, France 9.0 %, Croatia 16,2%, Italy 16.5%, Austria 29.6%, Portugal 23.5% Slovenia 16.5%, Finland 29.2%, Sweden 34.8%, United Kingdom 5.0%, Norway 37.4%, Montenegro 36.9% and Serbia 12.8%. The participation of a renewable energy in the total final energy consumption of some countries in the European Union in 2013 was as follows: The European Union (EU-28) 15.0%, Germany 12.14%, France 14.2%, Croatia 18,0%, Slovenia 21.5%, and the United Kingdom 5.10% (Eurostat).

From the showed data it is easy to conclude that the share of renewable energy in total energy consumption in Serbia is less than in other comparable countries in the region (Croatia and Slovenia). In Serbia, extensive utilization of power plants significantly reduces cost of production, which reflects positively on the cost of energy in all sectors, including trade. Under the influence of specific factors, final energy consumption also varies in individual sectors. Thus, for example, in the 2013 final energy consumption in the EU by individual sectors is as follows: transport 31.6%, households 26.8%, industry 25.1%, services 13.8%, agriculture and forestry 2,2%, and others 0.5% (Eurostat).

Energy costs significantly affects price which differs among countries. Table 3 shows the price of electricity in the industry for selected countries in the European Union.

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TABLE 3- COST OF ELECTRICITY (PER KWH) IN THE INDUSTRY OF SELECTED COUNTRIES IN THE EUROPEAN UNION, 2013 - 2015

	2013	2014	2015
European union (EU-28)	0,119	0,123	0,121
Germany	0,143	0,159	0,151
France	0,097	0,096	0,101
Croatia	0,095	0,096	0,092
Slovenia	0,097	0,087	0,083
United Kingdom	0,117	0,129	0,149
Serbia	0,057	0,051	0,060

Source: Eurostat

The price of electricity in Serbia in 2015 was slightly higher compared to previous years, which resulted in an increase in energy costs. Nevertheless, it is lower than the European Union average, the observed countries of the European Union and the region.

Energy costs in trade of Germany

As in other countries, general and specific factors affect energy costs in trade of Germany. Table 4 shows the energy consumption in the retail trade in Germany for the period 2006 - 2013.

TABLE 4- PROJECTED ENERGY USE IN THE RETAIL TRADE IN GERMANY, 2006 - 2013

	2006	2007	2008	2009	2010	2011	2012	2013
Energy unit: TWh	67,6	64,5	62,1	62,4	65,9	59,1	61,1	63,0
The share of retail trade in the total balance energy consumption in the tertiary sector (%) *	15,85	17,74	15,49	16,57	16,00	15,80	16,35	16,05

Note: * Calculation performed by the author

Source: Fraunhofer ISI (2015). Energy consumption of the tertiary sector (trade, commerce and services) in Germany for the years 2011 to 2013 (http://www.isi.fraunhofer.de/isi-wAssets/docs/x/de/projekte/Final-report_GHD_2006-2013_Summary_February2015.pdf). (July 16, 2016)

Retail in Germany participated in total balance energy consumption in the tertiary sector (in 2013) to about 16%. The structure of consumption of electricity in the retail trade in Germany (in 2013) involved: lighting 48.9%, plants 9.3%, water heating 3.1%, other heating processes 2.7%, cooling process 18.7%, AC (air-conditioning) with 2.2%, ICT (information and communication technology) 8.4% and space heating 6.2%. The largest share in the consumption of electricity goes on lighting and cooling.

The structure of fuel consumption in retail trade in Germany (in 2013) was: water heating 3,2%, AC (air-conditioning) 0.5%, space heating 96.1% (Fraunhofer ISI, 2015: Energy consumption of the tertiary sector (trade, commerce and services) in Germany for the period 2011 to 2013 http://www.isi.fraunhofer.de/isi-wAssets/docs/x/de/projekte/Final-report_GHD_2006-2013_Summary_February2015.pdf). In fuel consumption the largest part refers to the surface heating.

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All in all, the structure of energy consumption in the retail trade in Germany is similar to that in other comparable countries. It is primarily determined by the nature of business in retail trade.

The cost of energy in trade of the United Kingdom

In the United Kingdom service sector participated in 2008 with 19% in total energy consumption. The share of the retail sector in the total energy consumption in the service sector in 2008 amounted to 20%. Total energy consumption in the retail sector in 2008 was consumed as follows: lighting 32%, heating 31%, catering 13%, cooking 8% and other 16% (Basarir, 2010). Carbon Trust is, as noted above, found that reducing energy costs by 20% contributes to an increase in sales of 5% (Carbon Trust, 2006, by: Basarir, 2010). In the United Kingdom, research has found that replacing existing with new energy-efficient equipment can increase the market value of the shopping center up to 5% (Energy Efficiency Shows Its Worth for Retail Property, https://www.gresb.com/insights/2015/08/energy-efficiency-shows-its-worth-for-retail-property/).

In the United Kingdom, the goal is to reduce carbon dioxide emissions by 34% by 2020 and 80% by 2050. Given the economic importance (5% share in GDP and the number of employees by 10%) retail plays an important role (Improving energy efficiency of retail sector is a commercial necessity; http://www.thecrownestate.co.uk/news-and-media/views-and-analysis/paul-clark-improving-energy-efficiency-of-retail-sector-is-a-commercial-necessity/). By 2050, according to the British Retail Consortium (BRC) retailers in the United Kingdom can decrease energy costs up to £ 4.1 billion and carbon dioxide emissions by 25% by using the appropriate energy efficiency programs (25-in-5: BRC launches new initiative to stimulate retailer energy efficiency, http://www.edie.net/news/6/BRC-initiative-launched-to-stimulate-energy-efficiency-in-retail-sector/). (July 16, 2016)

Energy costs in trade of Serbia

In Serbia, as in other countries, energy costs are important determinant of profitability of trade. Table 5 shows the share of the cost of materials, fuel and energy in total operating revenues (i.e. sales revenue) and operating expenditures in the trade of Serbia for 2013 and 2014.

TABLE 5- THE SHARE OF COSTS OF MATERIALS, ENERGY AND FUEL IN TOTAL OPERATING REVENUES AND OPERATING EXPENDITURES IN THE TRADE OF SERBIA, 2013 AND 2014

	2013	2014
Share of costs of materials, energy and fuel in operating income, (%)	3,77	3,91
Share of costs of materials, energy and fuel in operating expenditures, (%)	3,88	4,03

Note: Calculation performed by the author

Source: Annual financial statements bulletin 2014 (Jul 2015). The Republic of Serbia, the Agency for Business Registers, Belgrade.

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Data presented clearly show that cost of materials, fuel and energy in 2014 participated in total operating revenues in trade of Serbia with 3.91% and in operating expenditures with 4.03%. Given the high proportion of total operating revenues (i.e. sales revenue) they are higher compared to trades of other comparable countries. By applying appropriate energy programs, above all so-called "green energy", they can be significantly reduced in order to increase profitability in the trade of Serbia.

Energy costs in food retailing

Due to their nature, energy costs are very important factor in the cost efficiency and profitability in food retailing (Lukic et al. 2014). This is supported by the following data: in the United States in 2013, the structure of the price of one food dollar ($) consisted of: farm production 10.5 ¢, food processing 15.5 ¢, packaging 2.6 ¢, transportation 3.3 ¢, wholesale 9.2 ¢, retail 13.1 ¢, food servicing 31.5 ¢, energy 5.2 ¢, finance and insurance 3.2 ¢, propaganda 2.5 ¢ and other 3.4 ¢ (USDA Economic Research Service, Food Dollar Series).

In order to obtain complete picture of the impact of energy costs on the price of food, Table 6 and Figure 2 show components of food costs in retail of the United States for 2015.

TABLE 6- COMPONENTS OF FOOD COSTS IN RETAIL OF THE UNITED STATES, 2015

Cost component	Percent
Foodservice	32%
Food processing	16%
Food retail	13%
Farm production	11%
Wholesale	9%
Energy	5%
Finance and insurance	3%
Transport	3%
Packaging	3%
Propaganda	3%
Agribusiness	2%
Law and accounting	1%

Source: USDA's Economic Research Service's Food Dollar Series, accessed July 23, 2015 at (www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx). (July 16, 2016)

The energy costs in the United States participated in one food dollar in 2013 with 5.2 cents (USDA Economic Research Service, Food Dollar Series) and in 2015 with 5% (Table 6). As the relevant data show, this means that they are very important factor in food prices in retail of the United States. Saving energy costs could, therefore, have significant impact on increase of profits in food retail.

In the United Kingdom, food chain represents 18% of the total energy consumption, 176 MtCO2e emissions of carbon dioxide and 15 Mt of food loss. The total emission of carbon dioxide in the agro-food

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sector in the United Kingdom retail accounts for 11 MtCO2 (Tassou, 2014). In the United Kingdom, in major food retail chains (Tesco, ASDA, Sainsbury's, Morrisons and small chains such as Somerfield, Waitrose, Iceland, co-ops and other multiple chains and independent) energy consumption of electricity is 8385 GWh, gas 2,477 GWh, and the total carbon dioxide emissions are 4.0 MtCO2 (Table 7).

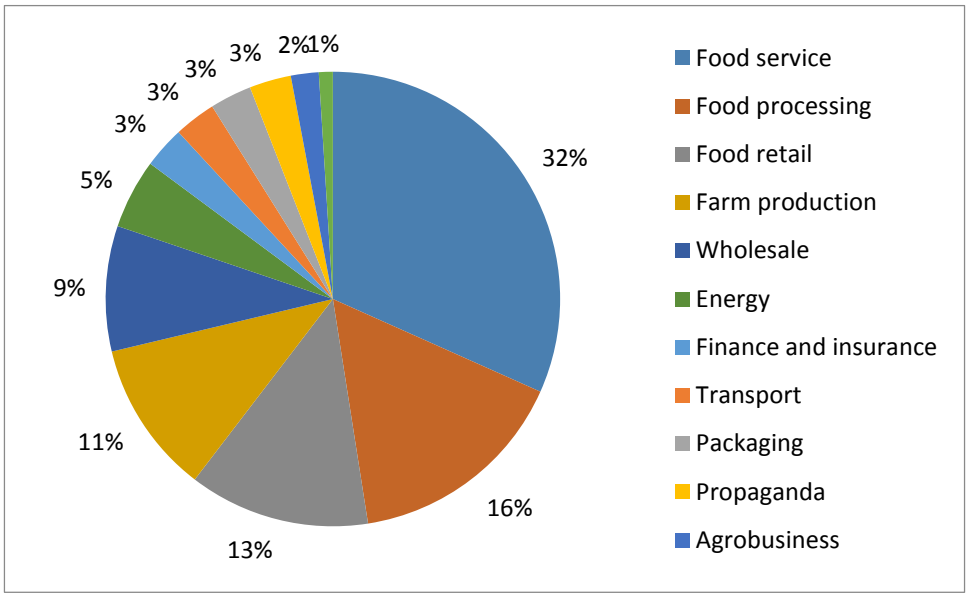

Figure 2 - Components of food costs in retail of the United States, 2015
Source: Own Picture (Source: Table 6)

TABLE 7- ANNUAL ENERGY CONSUMPTION AND CARBON DIOXIDE EMISSIONS IN THE 10 LARGEST FOOD RETAILERS IN THE UNITED KINGDOM

	Supermarket electrical energy consumption (GWh)	Gas energy consumption (GWh)	CO_2 Emission electrical power (tonnes)	CO_2 Emission gas (tonnes)	CO_2 Total Emissions (tonnes)
10 major UK retail food chains	8385	2477	3538470	470630	4009100 (4,01 $MtCO_2$)

Source: Tassou et al., 2011

Energy consumption and carbon dioxide emissions vary widely between supermarkets. This is affected by many factors, such as type and size of store, business politics and product range, cooling, as well as used environmental control systems. By applying appropriate measures 10% of energy can be saved, or 840 GWh, which represents a reduction of 350,000 tons of carbon dioxide (Tassou et al. 2011).

In the food retail energy consumption is affected by different factors depending on the type of stores and product categories. So, for example, in supermarkets, energy consumption depends on business operations, types of stores, product mix, shopping activities, and equipment used for food preparation, storage and presentation. Annual energy consumption varies from 700 kWh/m2 of sales area in

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hypermarkets to 2000 kWh/m2 of sales area in classic stores. Energy consumption for cooling can vary from 30% to 60%, lighting 15% to 25%, and for HVAC, bakery and other (Tassou et al. 2011).

In food retail gas is commonly used for heating of sales area, water, cooking and bakery. Annual gas consumption varies: 0 kWh/m2 in small shops (gas stations - where the gas is almost never used) to more than 250 kWh/m2 in hypermarkets. In some stores the annual energy consumption of gas can be high (up to 800 kWh/m2).

In UK hypermarkets the percentage of energy consumption structure is as follows: refrigeration 29%, lighting 23%, storage 3%, staff restaurant 4%, offices 4%, customer restaurant 7%, heating, ventilation and air-conditioning 9%, other: external lighting, ATMs, lift, etc. 9%, bakery and preparation 12% (Tassou et al. 2011). Therefore, most energy is consumed for refrigeration and lighting.

The category of food determines the carbon dioxide emissions related to the consumption of energy. Carbon dioxide emissions in relation to energy consumption for fresh packed meat is as follows: refrigerant leakage 45%, lighting 3%, heating, ventilation and air-conditioning 2%, plastic shopping bags 2%, food waste including transportation 2%, refrigerated warehouse 0%, transport 3%, refrigerated display cabinets 42%, walk-in coolers and freezers including refrigerant leakage 1%. Percentage of carbon dioxide emissions related to energy consumption for frozen peas is as follows: refrigerant leakage 34%, lighting 3%, heating, ventilation and air-conditioning 2%, plastic shopping bags 1%, food waste including transportation 1%, refrigerated warehouse 0%, transport 1%, refrigerated display cabinets 57% (Tassou et al. 2011). As with the fresh packed meat, so with the frozen peas - the highest percentage of carbon dioxide emissions related to energy consumption relates to the refrigerant leakage and refrigerated display cabinets. The share of services costs in total net sales of 8 retailers (Industry P & L includes in avg. of 8 firms - Kroger, Safeway, Supervalu, Whole Foods, Winn Dixie, Harris Teeter, Weis Markets, Spartan Foods) is 1.3%. The services costs include the energy costs. Lower energy costs, greater the profit. Typical energy distribution in grocery (food) stores is: cooling 38%, lighting 23%, heating 13%, cooling 11%, cooking 5%, water heating 2%, ventilation 5%, and other 3% (LG The Food Retail Industry - An innovative, sustainable retail environment, http://www.lg-vrf.com/Assets/LG%20Retail%20-%20Why%20LG%20in%20Retail%20Space%202012%20V1_20111109090350.pdf). (July 16, 2016) The largest part of energy cost in the typical food stores refers to refrigeration (38%), and lighting, heating and cooling (47%). Significant energy savings can be achieved with effective management, and launching initiatives for greater use of renewable energy sources.

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3. THE IMPORTANCE OF "GREEN ENERGY" APPLICATION IN RETAIL

All retail companies increasingly use so called, "green energy" due to its economic importance. Table 8 shows the ten largest retailers according to the share of green energy in total energy consumption. Green energy application is positively reflected in their performance.

TABLE 8- THE SHARE OF GREEN ENERGY IN TOTAL ENERGY CONSUMPTION OF SELECTED RETAILERS

Retailer	Annual green power usage (kWh)	GP (%) of total electricity used	Green power resources
Koch's Department Stores	1,429,749,630	104%	Solar
Starbucks	696,982,000	69%	Wind
Wal-Mart Stores, Inc.	314,843,272	16%	Solar, Wind
H&M	171,632,065	100%	Various
Ahold USA	157,567,165	8%	Solar
Best Buy	108,874,000	14%	Various
REI	67,263,234	101%	Biogas, Biomass, Small-hydro, Solar, Wind
The Estee Launder Companies Inc.	63,385,653	89%	Solar, Wind
H-E-B Grocery Company	59,000,000	4%	Wind
Sundance Square	30,334,826	46%	Wind

Source: Top 30 Retail / Green Power Partnership / US EPA (http://www3.epa.gov/greenpower/toplists/top30retail.htm) (July 16, 2016)

All global retailers have increasingly implemented best practices for sustainable development (Ayding, 2015). In that context, significant attention is paid to energy management. This certainly has a positive impact on their overall performance.

4. ENERGY COSTS OF SELECTED RETAILERS

Retailers provide different energy management philosophy. In further presentations of treated issues we will refer to the retailers with the best practice of energy management.

Managing energy costs in IKEA

The company IKEA gives great importance to the concept of sustainable development. The objectives of sustainable development for IKEA are: solar energy system use, use of sustainable materials in production, and improving the quality of life of employees and customers. The company IKEA pays significant attention to reducing energy costs and carbon dioxide emissions (Table 9).

Planned share of renewable energy in the total energy consumption in 2015 for company IKEA is 70% and in 2020 - 100%. Likewise, the planned reduction of carbon dioxide emissions in its own business operations in 2015 is 50%. The reduction of carbon dioxide emissions in doing business with suppliers in

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2015 is expected to be 20%. In the future all this will definitely have a positive impact on the overall profitability of the company IKEA.

TABLE 9- THE SHARE OF RENEWABLE ENERGY IN TOTAL ENERGY CONSUMPTION IN IKEA

	2013	2014	Goal
Renewable energy produced as share of total energy consumption, (%)	37%	42%	70% by 2015. 100% by 2020.
Reduction in carbon dioxide emissions from own business operations, (%) (compared to 2010 baseline and relative to sales)	19%	24%	50% by 2015
Reduction in relative carbon dioxide emissions from business with suppliers, (%) (compared to 2012)	0	11,4%	20% by 2015.

Source: IKEA Group Sustainability Report FY14 (http://www.ikea.com/ms/en_US/pdf/sustainability_report/sustainability_report_2014.pdf) (July 16, 2016)

Managing energy costs in COSTCO

The company COSTCO pays considerable attention to efficient management of energy costs, i.e. their reduction and, in that context, the reduction of carbon dioxide emissions. Table 10 shows the dynamics of reduction of carbon dioxide emissions in COSTCO for the period 2009 - 2013.

TABLE 10- EMISSIONS OF CARBON DIOXIDE IN COSTCO, 2009 - 2013

	tCO_2e	Annual growth	tCO_2e/Sales
2009	1,521,968		2,3%
2010	1,560,785	2,6%	2,2%
2011	1,550,443	-0,7%	1,9%
2012	1,549,519	-0,1%	1,7%
2013	1,663,953	7,4%	1,8%

Source: Costco Wholesale Sustainability Report 2015 (phx.corporate-ir.net/External.File?item...t=1) (July 16, 2016)

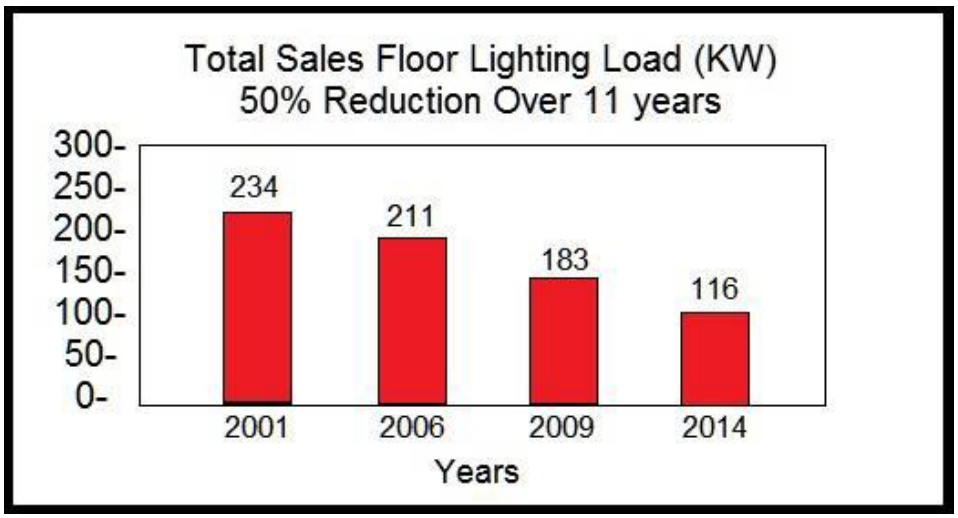

FIGURE 3- REDUCTION OF LIGHTING COSTS IN THE COMPANY COSTCO
Source: Costco Wholesale Sustainability Report 2015 (phx.corporate-ir.net/External.File?item...t=1) (July 16,2016)

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From 2001 to 2014 the company COSTCO achieved a reduction in lighting by 50% (Figure 3) and energy efficiency of heating, ventilation and cooling increased by 25%. There is an increased use of photovoltaic systems in the company COSTCO (Figure 4). All this reflects positively on its overall performance.

The company COSTCO increased energy efficiency in relation to HVAC (heating, ventilation and air-conditioning) by 25%. This has been achieved with increased use of solar systems (Solar PV (Photovoltaic) Systems), as can be seen from Figure 3.

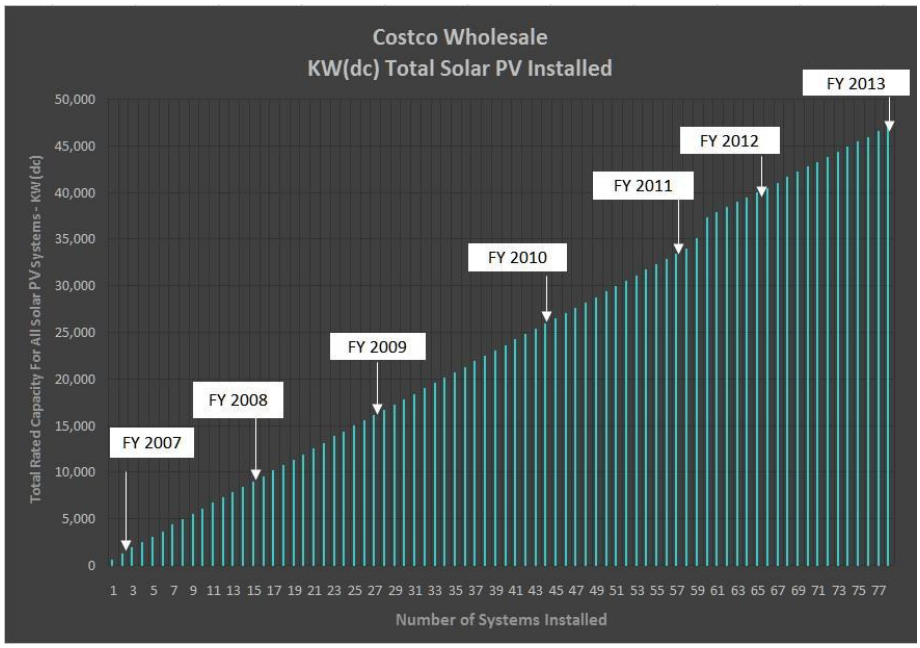

FIGURE 4- THE USE OF SOLAR ENERGY IN THE COMPANY COSTCO
Source: Costco Wholesale Sustainability Report 2015 (phx.corporate-ir.net/External.File?item...t=1) (July 16, 2016)

Managing energy costs in Wal-Mart

The company is Wal-Mart, as well as its major competitors, also devotes significant attention to sustainable development in order to continually improve its performance. The objective is to achieve long term 100% use of renewable energy, zero losses and sell products that fit consumers and the environment. Wal-Mart increases the share of renewable energy in total energy consumption (Table 11), and rapidly replaces the existing with new more efficient energy installation. Electricity is 26% used from renewable energy sources, and the share of renewable energy in the total energy consumption is 21% (Wal-Mart - 2015 Global Responsibility Report).

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Considerable attention in Wal-Mart is given to reduction of carbon dioxide emissions. Table 12 shows the emissions of carbon dioxide and retail areas in Wal-Mart for the period 2005 - 2013. It is noticeable tendency for lower emissions carbon dioxide emissions related to energy consumption in recent years.

TABLE 11- TOTAL RENEWABLE ENERGY (GWH) IN WAL-MART, 2011 - 2015

	FY2011	FY2012	FY2013	FY2014	FY2015
Total renewable energy (GWh)	640	1,200	1,080	2,250	3,021

Source: Walmart - 2015 Global Responsibility Report (http://cdn.corporate.walmart.com/f2/b0/5b8e63024998a74b5514e078a4fe/2015-global-responsibility-report.pdf) (July 16, 2016)

TABLE 12- EMISSIONS OF CARBON DIOXIDE AND RETAIL AREAS IN WAL-MART, 2011 - 2015

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Carbon dioxide emissions (in million tons CO2e)	740	805	867	921	952	985	1,037	1,072	1,102
Retail area (in million square meters)	18,9	19,3	20,1	20,8	20,3	20,6	20,8	20,12	20,10

Source:http://cdn.corporate.walmart.com/f2/b0/5b8e63024998a74b5514e078a4fe/2015-global-responsibility-report.pdf) (July 16,2016)

Generators (i.e. sources) of carbon dioxide in Wal-Mart are: purchased energy 72,0%, refrigerants 12.0%, transport fuel 8.5%, on-site fuel 8%, and mobile refrigerants 0.1% (Wal-Mart - 2015 Global Responsibility Report). Continuous improvement of total energy efficiency has positive effect on the profitability of the company.

Wal-Mart pays considerable attention to continuous improvement of energy efficiency in existing retail outlets and on that basis expects reduction up to 20% in energy consumption per square meter in 2020 (Walmart - Saving Energy, Saving Money Through Comprehensive Retrofits, the US Department of Energy, Energy Efficiency & Renewable Energy, Commercial Building Efficiency Energy, http://www.nrel.gov/docs/fy15osti/63782.pdf). All in all, the increasing application of the concept of sustainable development has a significant impact on the profitability of this company.

Managing energy costs in METRO GROUP

Significant reduction of overall consumption of electricity and energy for heating is achieved at Metro Group, as seen from the data shown in Table 13. It has a positive impact on its overall performance.

TABLE 13- ELECTRICITY AND ENERGY CONSUMPTION FOR HEATING IN THE METRO GROUP, 2012 - 2013/14 (IN KWH PER M2 OF SALES AREA)

	2012	2012/14	2013/14
Electricity	331	311	294
Heating	103	106	87
Total	434	417	381

Source: METRO Group - Corporate Responsibility Report 2013/14 (www.metrogroup.de /.../ reports / metro-group-corporation...) (July 16, 2016)

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In Metro Group, considerable attention is paid to the reduction of carbon dioxide emissions. It is shown by the data in Table 14. The aim is to reduce carbon dioxide emissions by 20% (from 330 kg/m2 in 2011 to 2644 kg/m2 in 2020). Likewise, the goal is to reduce carbon dioxide emissions by 10% in relation to energy consumption for heating in the period 2011 - 2020 (Metro Group Corporate Responsibility Report 2013/14) so as to improve the overall performance of the Metro Group.

TABLE 14- CARBON DIOXIDE EMISSIONS IN KG CO2 (CO2 EQUIVALENT) PER SQUARE METER OF SELLING AREA IN METRO GROUP, 2011 - 2013/14

	2011	2012	2012/13	2013/14
Carbon dioxide emissions in Metro Group in kg CO_2 (CO_2 equivalent) per m^2 of sales area	330	323	301	273

Source: METRO Group Corporate Responsibility Report 2013/14 (www.metrogroup.de /.../ reports / metro-group-corporation...) (July 16, 2016)

5. CONCLUSIONS

Energy costs are significant component of operating costs and profits in trade, especially in food retailing. The size and structure of energy costs in retail is influenced by numerous controlled and uncontrolled factors. These are: climate zones, location, age and isolation of building, the size of store, type of commodity, energy system, caring staff, energy prices, the amount of energy consumed and others. Acquaintance of the effects of individual factors is important for efficient energy management in retail.

In recent years, the key factor for improving energy efficiency in retail is usage of renewable energy sources. Due to this, the goal of global retailers in perspective is more use of renewable energy sources in total energy consumption. Likewise, it is the reduction of carbon dioxide with respect to energy consumption. All this will decrease the energy costs of the global retailers. Positive economic effects of reducing energy costs in retail are: further increase in sales, profits and return on investment.

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