ENERGY EFFICIENCY IN THE FOOD RETAIL

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Abstract
In this paper the emphasis is put on the specifics of energy efficiency impact on the profitability of the service sector, with special insight into food retail. The theoretical and methodological presentations are illustrated by applying the comparative approach, on the original empirical data of food retailers. Because of the importance of energy costs in the retail food, it is important to take appropriate measures to ensure their reduction as a very important factor in increasing profits. These measures may be of a different nature. Thus, for example, sustainable ways to save energy costs in the retail food are: efficient lighting, cooling, heating, energy management and initiative for increasing the renewable energy sources use. This certainly includes the use of new energy efficient technologies and construction of energy efficient office buildings and stores in food retail sector (with continual improvement of existing ones).
Keywords: Quality, Human resources, Quality management, Human resource assessment.

1. INTRODUCTION

In the context of the analysis of the impact of energy efficiency on the performance in service sector, special attention is given to the specifics of the trade energy efficiency, primarily the leading global food retailers, such as Tesco. In order to increase customer satisfaction, profits, and to achieve greater application of the concept of sustainable development, global food retailers develop special strategies for improving energy efficiency management, water consumption, carbon dioxide emissions and food waste treatment. In order to achieve fully integrated accounting information system reports, special public reporting known as - sustainable reporting became a business practice in recent years. Sustainable reporting of the global food retailers (e. g. Wal-Mart) is increasingly becoming an integrated part of their annual reporting for which the public is interested in.

The research presented in this paper is the energy costs in trade with special reference to food retailers. The goal is to get as complete with the character looks, size and structure of energy costs in the retail food. This is a prerequisite for the efficient management of energy costs in the retail food. The effects of this are food retailers increase profits.

There is growing body of literature on energy efficiency analysis in recent years. It is understandable

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when one takes into account the fact that energy efficiency is a key factor in the profitability of all companies. Nevertheless, existing literature dedicated primarily to the issues of energy efficiency in the service sector, with particular reference to food trade is not extensive. All relevant issues are still not sufficiently theoretically, methodologically and empirically researched. In that we find the scientific and professional opportunity for writing this article. It seeks to draw attention to most significant aspects of managing energy in the service sector, with special insight into food trade. In order to draw attention to the researched issues, theoretical and methodological presentations are illustrated with original empirical data from different countries, especially the European Union and Serbia. The research conducted in this and other studies show that the efficient management of energy can significantly reduce costs (total costs and energy costs), and thus increase profits in the service sector, including trade.

The paper presented hypothesis that efficient energy management significantly affects the improvement of the profitability of the companies, including service and trading. The research methodology of issues in this paper is based on the theory, norm and, in particular, comparative analysis of empirical data (indicators) of service sector energy efficiency, with a special insight into food trade of selected countries with developed market economy and Serbia. Within the applied research methodologies, indicators of energy intensity are very important, and to some extent specific to the service sector, trade and food retail. Based on their comparative analysis it is very easy to perceive the energy efficiency and its impact on the profitability of the observed service companies, for example, food retailers (such as Wal-Mart or Tesco).

The empirical data were collected from different sources: literature, Eurostat, annual reports and other relevant statistics. To some extent, they undergo secondary processing in accordance with the aim of the research issues.

2. MANAGING ENERGY IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

Considerable attention of the service sector is lately directed to improvement of energy efficiency management in the framework of sustainable development (Lukic, 2014d; Christina, 2015), and the emission of carbon-dioxide in the context of energy consumption. Energy management is increasingly treated as a separate centre of responsibility in all enterprises, including service, and trade, and food retail (Lukic, 2011, 2012, 2013a, b; 2014 a, b, c, d; 2015a, b, c, d, e; Vojteski Kljenak, 2015).

Figure 1 presents three aspects of energy efficiency and energy management in the context of sustainable development.

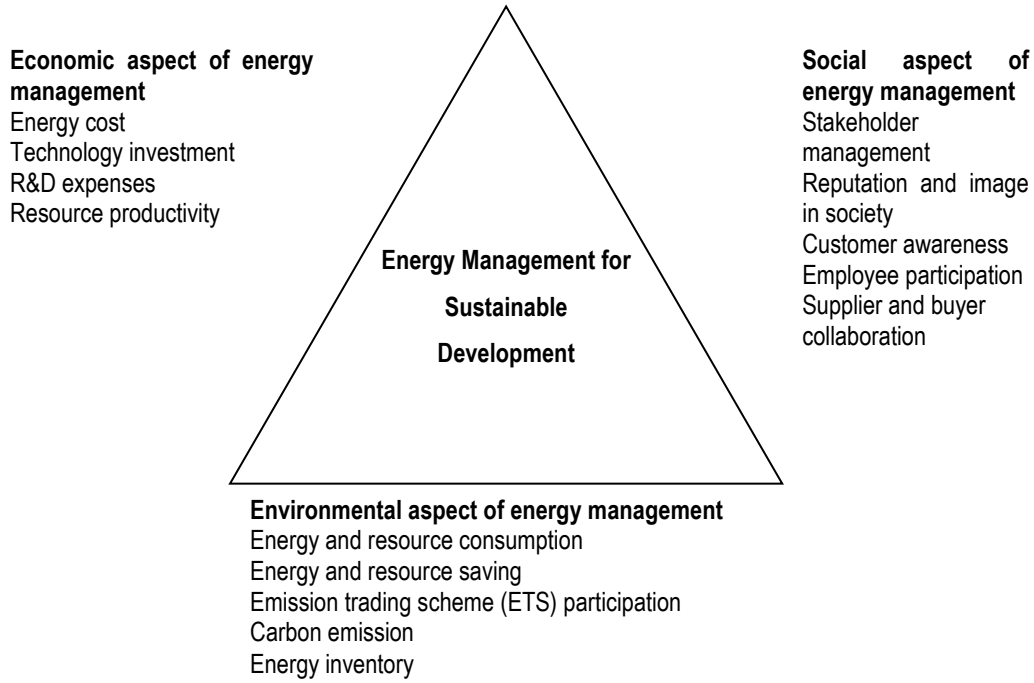

FIGURE 1 - ENERGY MANAGEMENT IN SUSTAINABLE DEVELOPMENT
Source: Lee, 2015

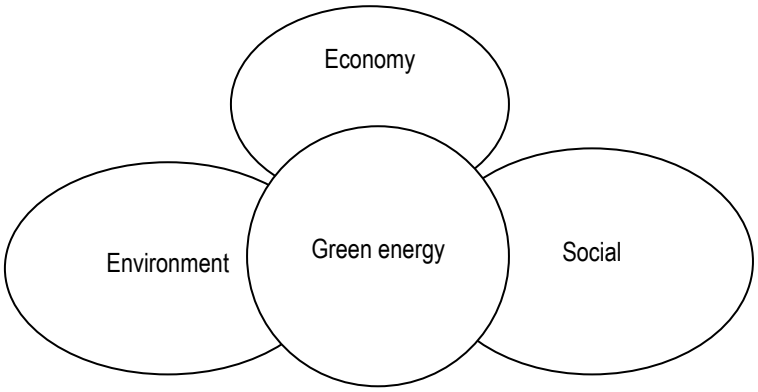

FIGURE 2 - GREEN ENERGY IN SUSTAINABLE DEVELOPMENT
Source: Kearney A.T. 2012

In the context of sustainable development (Eurostat: Sustainable development in the European Union – 2015 monitoring report of the EU Sustainable Development Strategy) in the service sector, trade and food retail, so-called “Green energy" significantly affects improving of the energy efficiency, as shown in Figure 2.

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3. ENERGY EFFICIENCY IN TRADE

According to estimates, annual power consumption in the retail sector is 20 billion dollars. By replacing the existing technology and applying best energy management practices, annual energy consumption can be reduced by 3 billion dollars (Jamieson, 2014). Almost all research studies came to similar results in terms of energy consumption by segment in the retail sector. Thus, for example, according to one study, the average percentage of energy consumption by segment in the retail food is: refrigeration - 48%, heating, ventilation and air-conditioning - 20% lighting - 18% and other 14% (Jamieson, 2014). Therefore, the higher energy consumption goes on refrigeration regarding the nature of assortment in the food retail sector. It could be significantly reduced by replacing existing ones with new energy efficient refrigeration systems. According to the same study, the percentage of energy consumption by segment in the non-food retail is: lighting - 50%, heating, ventilation and air-conditioning - 40% and other 10% (Jamieson, 2014).

Substantial energy savings could be generated by development of appropriate energy program in relation to heating, ventilation and air-conditioning and by using renewable energy sources. In the non-food retail primary source of energy is natural gas / other up to 33% and 67% electricity. Average consumption per square meter is 16.1 kWh (Jamieson, 2014). In terms of size, the average energy consumption per square meter in the so-called “big box stores” are: small (up to 5,000 square meters) - $ 1.42, medium (up to 50000 square meters) - $ 0.90 and large (over 50,000 square meters) - $ 1.40 (Jamieson, 2014). Significant energy savings can therefore be made for the small and large retailers, respectively. Among other factors, the electricity consumption in retail is also influenced by age and location of buildings in relation to the primary energy sources (Jamieson, 2014). Airfreight used for transportation in e-commerce for the transport of ordered products positively affects the energy efficiency of the logistics chain (Wang, 2014).

The share of trade in energy consumption differs among countries. So, for example, in the United States in 2006 commercial services sector participated in energy consumption as follows: 13% retail, service 13%, wholesale and storage 12%, offices 7%, other 18% (public assembly, food service, religious worship, education 37%) (Liu et al., 2011). Therefore, the share of total trade in energy consumption in the United States is significant. In the United States the average annual electricity consumption in retail is 14 kilowatt hours (kWh) and 31 cubic meters of natural gas per square meter of sales area (Managing Energy Costs in Retail Buildings, Business Energy Advisor; Available at: http://bizenergyadvisor.com). Structurally observed the percentage of energy use in retail buildings in the United States in 2006 amounted to: 35% heating, cooling 8%, ventilation 5%, lighting 35%, water heating 1%, cooking 1%,

refrigeration 7%, office equipment 1%, computers 1%, others 8% (Liu et al., 2011). According to another study, the percentage of electricity consumption by end use in retail in the United States is as follows: lighting 53%, refrigeration 9%, cooling 13% ventilation 8%, heating 3%, computer equipment 1%, office equipment 1%, water heating 1%, other 11%; and consumption of natural gas: 91% heating, cooking 3%, water heating 3%, other 3% note: the categories with a value of less than 1 percent are not shown (Managing Energy Costs in Retail Buildings, Business Energy Advisor; Available at: http://bizenergyadvisor.com). According to this data, lighting, cooling and heating participate in total energy consumption up to around 60% in retail. Energy costs participate in food stores with 15% of the operating budget. In these stores 1% of energy savings increases sales for $ 0.59 (Managing Energy Costs in Retail Buildings, Business Energy Advisor; Available at: http://bizenergyadvisor.com/grocery-stores). All in all, despite the different results of particular studies, the improvement of energy efficiency is an important factor in increasing the profitability of trade, especially retail in the United States.

In the context of sustainable development the issue of energy management in the retail sector is very important (Dangan, 2012; Schönberger, 2013; Dong, 2013). In the United States of America energy costs in retail amount almost $ 20 billion a year. Approximately 70% goes for lighting and heating (according to Energy Star - Retail). By improving energy efficiency retailers can reduce costs, increase customer satisfaction and profitability, as well as reduce emissions of carbon dioxide in stores. The reduction of energy costs by 10% affects the operational income and increase sales by an average of 1.25% in the store (PEPCOC & I Energy Saving Program – Retail, Available at: https://cienergyefficiency.pepco.com/). In retail, energy and services costs amount less than 5% of the total business cost. Their size is considerably affected by the nature of the retailer's business (i.e. type of store and goods which are traded). Given the nature of the business, they range between 5-10% of total operating expenses in retail of beverages, supermarkets, ironware and food shops (Relative Costs of Doing Business in Australia: Retail Trade, Productivity Commission Research Report, September 2014, the Australian Government). Therefore, product category affects energy consumption in retail. In other words, the share of service costs or energy costs in total sales revenue differs among product categories. According to the data presented in Table 1, they participate with 1.3% (in % of sales) in the food retail.

Similar participation is also in other studies. So, for example, energy costs participate in sales revenue with 1% in food retailing in Canada (Government of Canada, Natural Resources Canada - Energy benchmarking for supermarkets and food stores; Available at: http://www.nrcan.gc.ca/energy / efficiency / buildings / energy-benchmarking / 17188).

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TABLE 1 FIRM INDUSTRY REPORT ON INCOME (P & L) 2010

	% of sales
Net sales	100%
Merchandise costs	74,4
Gross margin	25,6%
Operating, G&A costs	20,2%
Utility costs	1,3%
Adj. operating profit	2,7%
Net profit	0,4%
CapEx	2,2%

Note: FMI (Food Marketing Institute) net margin estimate: 0.95%. Industry P & L includes 8 companies: Kroger, Safeway, Supervalu, Whole Foods, Winn Dixie, Harris Teeter, Weis Markets, Spartan. Assessment of the services cost is based on FMI data.
Source: The Food Retail Industry An innovative, sustainable retail environment, 2011 LG Electronics USA, Inc., Englewood Cliffs, NJ

In the United Kingdom, retail is a significant consumer of energy. Energy costs in retail in 2013 amounted to 3.3 billion pounds. According to a survey (conducted by the Carbon Trust) it is established that with reduction of energy costs by 20% retailers increase sales by 5% (Blake, 2015). This is achieved by replacing existing ones with new energy efficient equipment, improvement of energy efficiency (in existing and new constructed buildings) in retail outlets, as well as the total transition to a business under the principles of "green economy".

The share of trade in the structure of energy consumption in the service sector of Australia is also very significant. According to estimates, used energy in commercial sector in Australia in 2020 (in % of total) should be as follows: retail 28%, offices 20%, education 11%, community 8%, accommodation 8%, health 8%, wholesale 6%, food service 6% and other 6% (Low Carbon Growth Plan for Australia, Retail Sector Summary Report, June 2011, Climate Works, Australia.). In that, total participation of retail trade is 28% and wholesale trade is 6%, 34% total trade respectively. According to the estimates, the percentage of energy consumption by segment in the retail trade of Australia, in 2020 will be: heating, ventilation and air-conditioning 37%, lighting 23%, refrigeration 16%, appliances 9%, electronics 7%, water heating 6% and cooking 2% (Low Carbon Growth Plan for Australia, Retail Sector Summary Report, June 2011, Climate Works, Australia.). Significant savings can, therefore, be achieved in the areas of heating and cooling by replacing the existing with the new energy-efficient technology and using renewable energy sources. Expected energy savings in the retail sector in Australia in 2020 in non-food retailing will be: energy waste reduction 10%, cooking 12%, refrigeration 13%, appliances 15%, insulation 16%, heating, ventilation and air-conditioning 16%, lighting 17%, heating, ventilation and air-conditioning positive interaction 20%, electronics 37% and water heating 48% and in food retail: heating, ventilation and air-conditioning 3%, cooking 4%, energy waste reduction 10%, refrigeration 13%, appliances 15%, lighting 16%, heating, ventilation air-conditioning positive interaction 20%,

insulation 21%, electronics 37% and water heating 45% (Low Carbon Growth Plan for Australia, Retail Sector Summary Report, June 2011, Climate Works, Australia.). It will definitely have a positive impact on the overall performance of retail sales in Australia.

According to the data presented in the table, cost of materials, fuel and power participated in total business revenue with 3.91% and operating expenses with 4.03% in 2014. It slightly increased compared to the previous year. As to optimize them in the future it is necessary therefore to increase the efficiency of management, in particular the formation of a special centre for energy management.

4. ENERGY EFFICIENCY FOOD RETAILERS

Energy consumption, carbon dioxide emissions and loss of food in the food supply chain (agricultural production, processing, distribution, retail and consumption) is significant. For example, in the UK energy consumption (in % of the total) in the food chain is 18%, carbon dioxide emissions is 176 MtCO2e and 15 Mt of food loss (Tassou, 2014). In food chain, retail is significant consumer of energy and producer of carbon dioxide emissions. In developed countries it participates between 3 and 5% of total energy consumption. In the UK, retail food sale participates with 3% in total energy consumption (Tassou, 2014). According to estimates, the carbon dioxide emissions, arising from retail operations, ranges between 6 and 9.5 MtCO2e (Tassou, 2014). The reduction of energy consumption and carbon dioxide emissions is therefore a significant factor in increasing profitability in food retailing. In the United Kingdom, major supermarkets, such as Tesco, ASDA, Sainsbury's and Morrisons, achieved in 2005 lower operating margin of 4.2% on average based on the reduction in energy consumption (Spyrou et al., 2014).

The primary sources of energy in the food retail are electricity and gas. On the research on hypermarkets it is established that in the structure of energy consumption gas accounts for 20% (Spyrou et al., 2014).

In the food retail, carbon dioxide emission is very significant seen from the standpoint of energy consumption. Thus, for example, the total annual CO2 emissions related to the consumption of energy in major food stores in the United Kingdom is about 4.0 MtCO2 (Tassou, 2011). In the United Kingdom food retail sector accounts for more than 3% of the total energy consumption and approximately 1% of the total emission of carbon dioxide (Spyrou et al., 2014). The research on the case in 2570 food retailers which account for about 30% of the total number in the United Kingdom has found that 10% of energy savings contributes to reducing 355,000 tons of CO2 emissions (Tassou, 2011, 2014).

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It is estimated that the retail sector in Australia will produce about 2,52% of the total carbon dioxide emissions of greenhouse gases in 2020. It is associated with the consumption of energy (gas, wood, fuel and electricity) for heating, cooling, lighting and appliances (Low Carbon Growth Plan for Australia, Retail Sector Summary Report, June 2011, Climate Works, Australia. Available at: http://www.climateworksaustralia.org/sites/default/files/documents/publications/climateworks_lcgp_australia_retail_sector_summary_june2011_0.pdf).

Energy consumption and carbon dioxide emissions are significantly higher in the wholesale and retail trade sector in China than in Japan (Yokoo et al., 2015). In Japan, retail sales participate with about 40% of total energy consumption in the commercial sector. Primary consumption of energy in food retail in Japan is 6,000 MJ / (m2 per year) (Suzuki et al., 2011).

In any case, in order to efficiently manage the energy costs in the retail food it is necessary to know their size - the percent of their participation in sale. Thus, for example, energy costs in Canadian supermarkets are around 1% of sales (Available at: http://www.nrcan.gc.ca/energy/efficiency/buildings/energy-benchmarking/17188).

As in other countries, trade in Serbia has very significant energy costs. Table 2 shows the energy costs of selected trading companies in 2013. The first three deal with food products selling, and the remaining two with fuels and petroleum derivatives.

TABLE 2 ENERGY COSTS OF SELECTED TRADING COMPANIES IN SERBIA, 2013

	Sales revenue (in 000 dinars)	Fuel and energy costs (in 000 dinars)	Share of fuel and energy costs in sales revenue, (%)*
Delhaize Serbia	75,817,380	840,390	1,24
Mercator-S	59,252,435	930,213	1,56
IDEA	55,072,112	770,036	1,49
Knez Petrol	37,289,281	320,250	0,85
OMV Srbija	30,937,667	156,577	9,50

Note: * Calculation performed by the Author
Source: Annual Reports - Business Registers Agency

According to the data presented in the table, the costs of fuel and energy are much higher in the retail chains that sell food (ranging from 1.24% to 1.56%) compared to ones that sell fuel and petroleum products (in which it is less than 1 percent). Based on these data we can conclude that the energy cost in Serbian trade are higher than in countries with developed market economy. The reasons for this are very low energy management efficiency, insufficient use of modern energy-efficient technology and equipment, unsatisfactory improvement of energy efficiency in existing and slowed construction of new energy-efficient office buildings and retail facilities, as well as a slight use of renewable energy sources.

All global food retailers devote considerable attention to the reduction of carbon dioxide emissions related to energy consumption in order to improve their overall efficiency. We will illustrate this on the example of the famous retailer Tesco, which devotes significant attention to sustainable development and environmental protection.

In Tesco company food losses in the retail and distribution centres in the United Kingdom amounted to 55,400 tons, or 0.9% of total sales in the stores in 2014. Compared to the previous year they were reduced for 1,180 tons (Tesco - Annual report 2015).

Table 3 shows the dynamics of carbon dioxide emissions in the company Tesco for the period 2006 - 2014.

TABLE 3 EMISSIONS OF CARBON DIOXIDE IN TESCO COMPANY, 2006 - 2014

	2006	2013	2014
Global net carbon dioxide intensity (total net emissions kg CO2e/m2)	64,33	39,71	37,99

Source: Tesco - Annual report 2015

The Tesco company total carbon dioxide emissions in 2014 amounted to 5.6 million tons of CO2e. That same year, global net carbon dioxide intensity in stores and distribution centres in the Tesco decreased by 4.3% compared to the previous year, and by 40.9% in comparison to 2006 (Tesco - Annual report 2015. Available at: http://www.tescoplc.com/files/pdf/reports/ar15/download_annual_report.pdf). Thus, the objective to reduce the carbon dioxide in this company is accomplished and the situation in this company is similar with its competition, such as Wal-Mart.

Energy consumption and carbon dioxide emissions depend on many factors, such as: type and size of store, business manner, assortment and interlinked cooling, climate zones and environment control system. Due to its economic importance, the majority of global retailers developed their own models of energy efficiency (Allcott, 2014), power management strategies and established special centres responsible for energy management. On this basis, they accomplish significant energy savings, lower energy costs, what positively affects their overall performance (Määttänen, 2014).

Special system of indicators of energy performance is developed for retailers. These are: specific energy generators expressed in kWh/m2 per year, primary energy use expressed in kWh/m2 per year, specific energy consumption expressed in kWh/m2 per year, consumption of green energy %, and carbon dioxide emission (expressed in appropriate measure unit, for example, kg). Also, internal energy performance indicators in retail are developed (such as, monitoring of power consumption by purpose: heating/cooling surface, cooling, lighting, etc., with detailed control of each energy segments, such as

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heating/cooling surface - heating loss in office building and shop, W/m2) (Martos-Galvey, J.-L, et al., 2013).

There are a number of actions to improve energy efficiency in the context of sustainable development in retail. These are: energy efficiency of operations; use of renewable energy sources in business; increase of product portfolio within the energy efficiency; collaboration with suppliers to improve energy efficiency of the supply chain; and reduction of packaging and packaging waste (Sustainable Energy for All: Opportunities for the Retail Industry, 2012, Accenture. Available at: https://www.accenture.com/t20150523T052048__w__/us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Strategy_2/Accenture-Sustainable-Energy-All-Opportunities-Retail-Industry.pdf). Integral application of these measures contributes significantly to improving energy efficiency in retail sales, which had a positive impact on its overall performance.

In order to improve energy efficiency in retail stores, at the closing of the research of treated issues, we should know the following: retail companies spend up to $ 20 billion of energy every year; reduction of energy costs by 10% may increase: net profit by 1.55% and sales per square meter for $ 25 in discount retail stores, net profit by 4% and sales per square meter for $ 17 in restaurants, net profit by 16% and sales per square meter for $ 44 in supermarkets (Energy Efficiency for Retail Stores; Available at: https://www.sba.gov/content/energy-efficiency-retail-stores).

5. 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. Available at: www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx).

In order to obtain complete picture of the impact of energy costs on the price of food, Table 4 and Figure 3 show components of food costs in retail of the United States for 2015.

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. Available at: www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx) and in 2015 with 5% (Table 4). 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.

TABLE 4 COMPONENTS OF FOOD COSTS IN RETAIL OF THE UNITED STATES, 2015

Cost component	Percent
Food service	32%
Food processing	16%
Food retail	13%
Farm production	11%
Wholesale	9%
Energy	5%
Finance and insurance	3%
Transport	3%
Packaging	3%
Propaganda	3%
Agrobusiness	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).

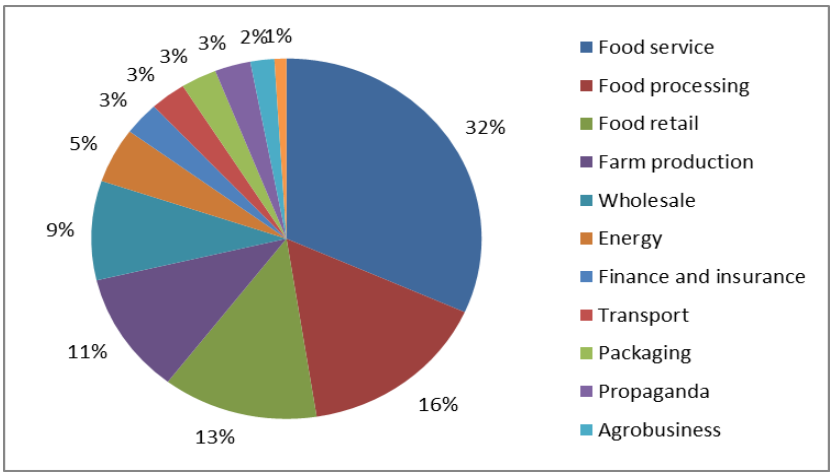

FIGURE 3 COMPONENTS OF FOOD COSTS IN RETAIL OF THE UNITED STATES, 2015
Source: Own Picture

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 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 5).

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

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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).

TABLE 5 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)	CO2 Emission electrical power (tonnes)	CO2 Emission gas (tonnes)	CO2 Total Emissions (tonnes)
10 major UK retail food chains	8385	2477	3538470	470630	4009100 (4,01 MTCO2)

Source: 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 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, Available at: http://www.lg-vrf.com/Assets/LG%20Retail%20-%20Why%20LG%20in%20Retail%20Space%202012%20V1_20111109090350.pdf). 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.

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

All retail companies increasingly use so called, "green energy" due to its economic importance. Table 6 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 6 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
Koh'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 (Available at: http://www3.epa.gov/greenpower/toplists/top30retail.htm)

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

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impact on their overall performance.

7. ENERGY COSTS OF SELECTED FOOD 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.

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 7 shows the dynamics of reduction of carbon dioxide emissions in COSTCO for the period 2009 - 2013.

TABLE 7 EMISSIONS OF CARBON DIOXIDE IN COSTCO, 2009 - 2013

	tCO2e	Annual growth	tCO2e/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 (Available at: phx.corporate-ir.net/External.File?item...t=1)

From 2001 to 2014 the company COSTCO achieved a reduction in lighting by 50% (Figure 4) and energy efficiency of heating, ventilation and cooling increased by 25%. There is an increased use of photovoltaic systems in the company COSTCO (Figure 5). All this reflects positively on its overall performance.

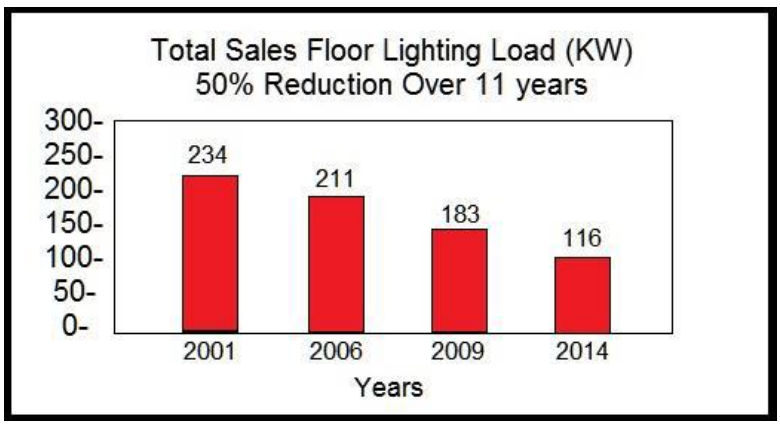

FIGURE 4 REDUCTION OF LIGHTING COSTS IN THE COMPANY COSTCO

Source: Costco Wholesale Sustainability Report 2015 (Available at: phx.corporate-ir.net/External.File?item...t=1)

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 5.

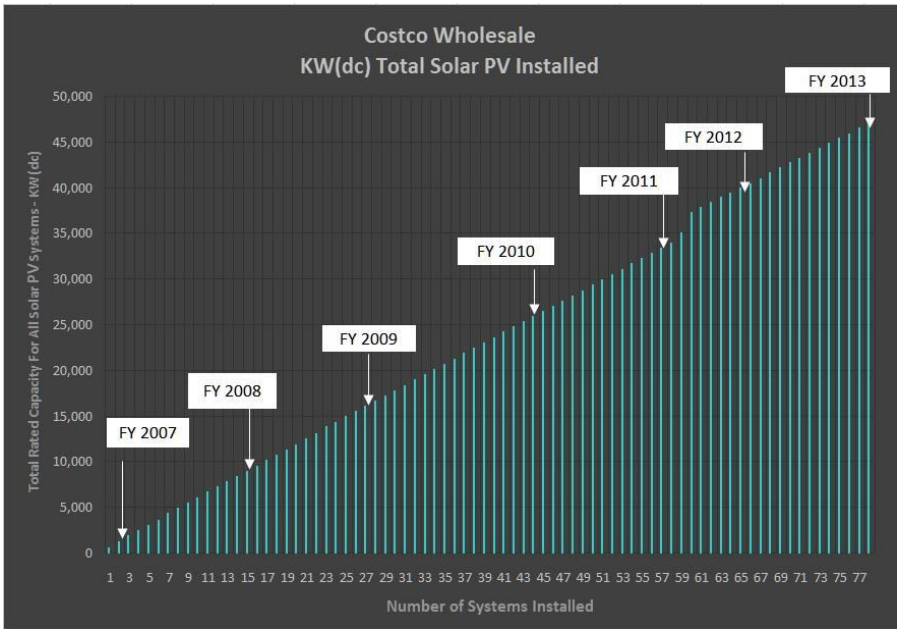

FIGURE 5 THE USE OF SOLAR ENERGY IN THE COMPANY COSTCO
Source: Costco Wholesale Sustainability Report 2015 (Available at: phx.corporate-ir.net/External.File?item...t=1)

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 8), 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. Available at: http://cdn.corporate.walmart.com/f2/b0/5b8e63024998a74b5514e078a4fe/2015-global-responsibility-report.pdf)).

TABLE 8 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: Wal-Mart - 2015 Global Responsibility Report (Available at: http://cdn.corporate.walmart.com/f2/b0/5b8e63024998a74b5514e078a4fe/2015-global-responsibility-report.pdf)

Considerable attention in Wal-Mart is given to reduction of carbon dioxide emissions. Table 9 shows the

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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 9 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: Wal-Mart - 2015 Global Responsibility Report ((Available at: http://cdn.corporate.walmart.com/f2/b0/5b8e63024998a74b5514e078a4fe/2015-global-responsibility-report.pdf)

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% (Walmart - 2015 Global Responsibility Report. Available at: http://cdn.corporate.walmart.com/f2/b0/5b8e63024998a74b5514e078a4fe/2015-global-responsibility-report.pdf). 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, Available at: 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.

8. CONCLUSION

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 (food) 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.

In food trade, energy costs participate in sales with around 1%. In this respect, there are differences from country to country. They are, according to the analyzed empirical data, much higher in the food trade in Serbia than in countries with developed market economy. In order to increase profitability, reduction of energy costs should be implemented. This can be achieved by replacement of existing heating, refrigeration and cooling systems with new energy efficient, and improving energy efficiency by better insulation in existing and new office buildings and food stores. All in all, greater application of the concept of sustainable development in trade Serbia also results in increasing energy efficiency.

The results of empirical research show that energy efficiency in the food retail sector in Serbia is considerably lower than in the European Union and other countries with developed market economy. Given that, it is necessary to introduce appropriate measures to improve energy efficiency of the food retail sector in Serbia in the future. These are: modern energy technologies, increase of renewable energy share in total final energy consumption, reduction of energy consumption throughout the entire supply chain, reduction of carbon dioxide emissions related to the energy consumption, construction of energy efficient office buildings and retail facilities, and improvement of the existing. The ultimate effects of this are to improve profitability in the food retail sector in Serbia.

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