European Union

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Bulgaria – Serbia
IPA Cross-Border Programme

R E P O R T

from the studies and prepared a detailed analysis of energy consumption
among primary and secondary schools in the Municipality of Pernik

by anonymous survey conducted after the students in primary and secondary schools
in the Municipality of Pernik for their level of awareness
on the topic of energy efficiency in school and at home, and to protect the environment

The Report was prerared:

based on a contract SERVICE CONTRACT FOR EUROPEAN UNION EXTERNAL ACTIONS, N° 003/30.05.2014, FINANCED FROM THE EU GENERAL BUDGET**,** NO 2007CB16IPO006-2011-2-78 "Energy efficient schools - our children deserve it", contract № РД-02-29-441/18.12.2013 "Energy consumption analysis and survey – bl.5 " Identification number 2007 CB16IPO006-2011-2-78-3 –SER. FINANCED FROM THE EU GENERAL BUDGET
in connection with a project for cross-border cooperation between Bulgaria and Serbia: Bugaria-Serbia IPA Cross-border Programee:
Project №2007CB16IPO006-2011-2-78 "Energy efficient schools - our children deserve it"

from **"GRN POWER BULGARIA" Ltd.** (**GRN**Power**Bulgaria**®) with headquarter and management address : 1404 Sofia , quarter "Strelbishtre" block 31A, ap.19 registered in the Public Register of the Registry Agency , UIC 201658843 , of the Sofia city Court, represented by Dipl. Eng. Vyara Nikolaeva Zlateva - Manager, holding a certificate №00309/20.09.2011 for registration in a public register of persons performing energy efficiency audits and certification of buildings according to Article 23a paragraph 1 of the Energy Efficiency Law (EEL) and Certificate №00067/12.07.2013 for registration in a public register of persons performing energy efficiency audits of industrial systems according to Article 34a paragraph 1 of the Energy Efficiency Law (EEL)

I. INTRODUCTION – Profiles of Municipality of PERNIK

Pernik municipality has an area of 477.21 square kilometers or nearly 20% of Pernik District.

Pernik is situated on both banks of the Struma River in the eponymous valley between the mountains Vitosha and Lyulin and Golo Brdo mountain ridge.

Pernik Municipality covers the following locations - town of Batanovci, village Bogdanov dol, village Bosnek, village Viskyar, village Vitanovtsi, village of Golyamo Bouchino, village Divotino, village Dragichevo, village Zidartsi, village Kladnica, village Kralev dol, village Leskovets, village Lyulin, village Meshtitsa, town of Pernik, village Planinitsa, village Raduil, village Rasnik, village Rudartsi, village Selishten dol, village Studena, village Cherna gora, village Chuypetlovo and village Yardzhilovtsi.

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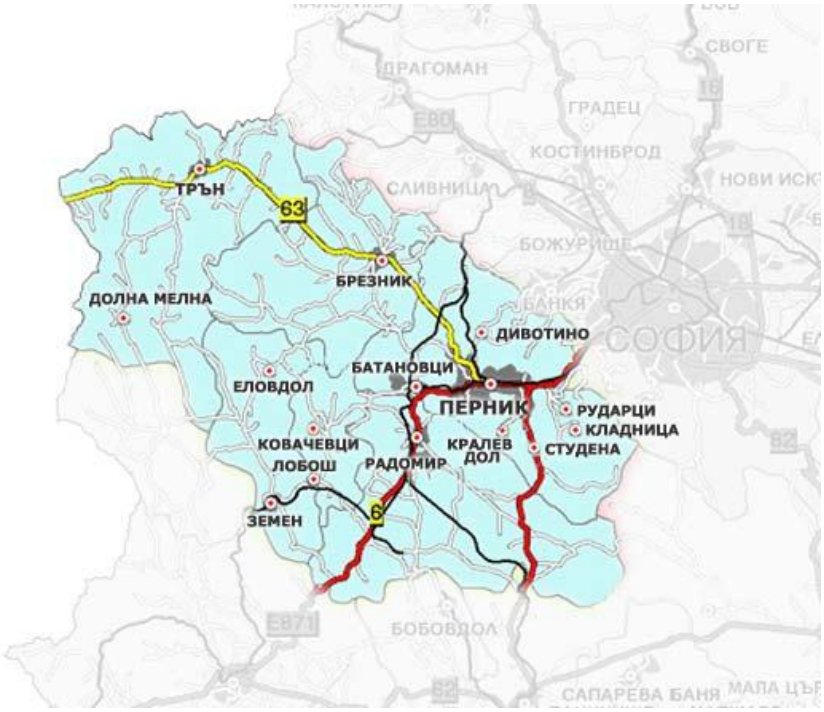

Pernik municipality is located in western Bulgaria in Pernik Valley. Borders the municipalities of Sofia, Breznik, Radomir and Kovachevtsi. Within the Municipality of Pernik are 2 towns (Pernik and Batanovtsi) and 22 villages. The area of the municipality is about 477.21 square kilometers, which is about 20% of the Pernik region. About 245 sq km agricultural land, which is 51.5% of the total territory of the municipality. About 25% forest cover. Higher the proportion of sites which extract minerals - 11.7% and 9.6% occupied settlements. Available resources in the municipality falls into the first category of municipalities in Bulgaria, it is 10th in population and 29th in area. The landscape is extremely diverse. Nearly 25% of the municipal territory is forested. Climate, Pernik Municipality falls within the moderate continental climate zone, and only the slopes of Vitosha Mountain in a mountain climate zone.

Population - people in the towns and villages of the Municipality of Pernik

Pernik: 80588

City Batanovtsi: 2437

Village of Bogdanov dol: 549

Village Bosnek: 248

Village Cherna gora: 354

Village Chuypetlovo: 57

Village Divotino: 1942

Village Dragichevo: 2046

Village of Golem Bouchino: 612

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Village Kladnitsa: 1242

Village Kralev dol: 703

Village Leskovets: 112

Village of Lyulin: 910

Village Meshtitsa: 1040

Village Planinitsa: 26

Village Raduy: 73

Village Rasnik: 429

Village Rudartsi: 1173

Village Selishten dol: 156

Village of Studena: 1840

Village Viskyar: 129

Village Vitanovtsi: 297

Village Yardzhilovtsi 1190

Village Zidartsi: 107

Pernik is a successor of the medieval city Krakra. In IV century BC Thracians built a fortress here. Rich archaeological finds attest to a Thracian settlement from the Late Neolithic.

The recent history of Pernik began in the last century with the development of the rich coal deposits in the area. According to some scholars coal are known from X-XI centuries. Before starting the industrial exploitation, indigenous people dig them with picks and shovels and transported with carts and wheelbarrows. The rapid development of Pernik is associated with large coal supplies to the capital for domestic use and for rail transport. Until then, rail, river and sea ships to deliver coal all the way from Cardiff, UK.

With the construction of the first mining districts on the terraces of the Struma River marks the beginning of Pernik mining village, 1 km east of the village. By 1929 Pernik is a city in 1958 - regional and district center today. During this period, reaching the height of its coal. Several decades, he has the energy heart of Bulgaria.

Pernik Municipality in its activities in the development of education and preschool education is guided by the belief that the main value of the educational system is the child, respectively - the student with their needs for growth, development and training. Activities of Pernik Municipality in education is implemented in accordance with the state policy in the education of the Republic of Bulgaria and taking into account the needs

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and specificities of the local education system. In this activity, reflected and implemented and priorities for education arising from the accession of Bulgaria to the European Union.

The strategy for the development of Europe called "Europe 2020" education and training is determined fundamental role in achieving its objectives of smart, sustainable and inclusive growth, in particular: young people to acquire skills and competences they need as European, and in particular the Bulgarian economy and society.

Creation of a favorable and stable environment for raising, training and education of children and students are the main priority of Pernik Municipality.

Despite the difficulties in the financial crisis, Pernik Municipality takes great care and effort and work for:

- construction of a modern material - technical basis in schools;
- Access to each child and student to quality information - communication technologies;
- new playgrounds;
- equal access to quality education;
- linking the disciplines and professions with the labor market and economic development;
- knowledge / awareness of children regarding environmental, energy and economic benefits of implementing energy efficiency measures in buildings of schools - their attitude towards rational use of energy, the environment and their contribution to the welfare of the region - Pernik Municipality.

Currently in Pernik, according to the Ministry of Education operate 22 public schools, six public vocational schools, a state special subsidiary school / for children with mental retardation / and a public service unit - a group of resource support. The number of students according to data from the official website of Pernik Municipality for the academic year 2010 – 2011 in municipal schools is 6865, divided into 334 classes, and in vocational schools is 2209.

This distribution of the school system in Municipality of Pernik currently meets the needs and requirements of children and students for education.

Professional schools of the Municipality of Pernik to professions that offer provide young people's needs for education and implementation and are associated primarily with the development of the local economy. These are architecture and construction; interior design and interior; computer-aided design; ecology; management and finance; Tourism and Hospitality.

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MUNICIPAL PRIMARY SCHOOLS

"Sveti Kliment Ohridski" Primary school (Village Kladnitsa)

Address: street: "Spas Burnov" No 7,
23047 Kladnitsa, municipality Pernik
Phone: +359 (0)7711 210
Email: Kladnitza_school@abv.Bg

Primary school in village of Kladnitsa is financed by the municipality school with kindergarten. Learning shifts: one shift – morning.

"Sv.Sv.Kiril and Metodiy" Primary school (Village Dragichevo)

Address: street "Vazrazhdane" No 66,
2351 Dragichevo, municipality Pernik
Phone: +359 (0)7718 2226; +359 (0)7718 2226
Email: ou_dragichevo@abv.bg
Website: http://ou-dragi4evo.hit.bg

Primary school in Village Dragichevo is financed by the municipality primary (I - VIII class) school. Learning shifts: one shift – morning.

"Sv.Kliment Ohridski" Primary school (Village Rudartsi)

Address: street: Hristo Smirnenski No 4, 2343 Rudartsi, municipality Pernik
Phone: +359 (0)7713 22-31
Email: ourudartci@abv.bg
Primary school "Sv.Kl.Ohridski" village of Rudartsi is financed by the municipality kindergarten. Learning shifts: one shift - morning

"Vasil Levski" Primary school (Village Studena)

Address: village of Studena, 2344 Studena, municipality Pernik
Phone: +359 (0)7715 2228
Email: ou_studena@abv.bg

Primary school "V. Levski" is financed by the municipality primary (I - VIII class) school. Learning shifts: one shift – morning.

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"Otets Paisiy" Primary school (Village Yardjilovtsi)

Type: Primary School

Location: Village Yardjilovtsi »

Address: street: "Partizan" No 21/A, 2355 YArdzhilovtsi, municipality Pernik

Phone: +359 (0)7719 21-26

Primary school "Otets Paisiy" is financed by the municipality primary (I - VIII class) school. Learning shifts: one shift - morning.

"Hristo Botev" Primary school (Town Batanovtsi)

Address: "Sv.sv.Kiril i Metodiy" 19,
2340 Batanovtsi, municipality Pernik
Phone: +359 (0)7712 24-42; +359 (0)7712 24-42
E-mail lilistoicheva@abv.bg
www.chrbotev.hit.bg

Primary school "Hr.Botev" is financed by the municipality primary (I - VIII class) school. Learning shifts: one shift - morning

"Sv. Ivan Rilski" Primary school (Town Pernik)

Address: "Monte Karlo" No 1, 2300 Pernik
Phone: +359 (0)76 60-79-24; +359 (0)76 60-76-12;
+359 (0)76 60-91-50
Email: ou_ivanrilski@abv.bg

OU "Sv. Ivan Rilski" is financed by the municipality primary (I - VIII class) school. Learning time: two shifts.

"Georgi Sava Rakovski" VII Primary school (Town Pernik)

Address: street: "Stara planina" No 14,
2307 Pernik
Phone: +359 (0)76 607957; +359 (0)76 609141

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"G. S. Rakovski" VII Primary school is financed by the municipality primary (I - VIII class) school. Learning time: 1 daily shift.

"Krakra Pernishki" VIII Primary school (Town Pernik)

Address: quarter of Klepalo, 2300 Pernik

Phone: +359 (0)76 601790; +359 (0)76 606491

"Krakra Pernishki" VIII Primary school is financed by the municipality primary (I - VIII class) school. Learning shifts: one shift – morning.

"Temelko Nenkov" IX Primary school (Town Pernik)

Address: quarter of "Tvardi livadi",
2300 Pernik

Phone: +359 (0)76 602913; +359 (0)76 608447;
+359 (0)76 602913

Temelko Nenkov" IX Primary school is financed by the municipality obshtoobrazovatelno, ou s profesionalni paralelki. Learning shifts: one shift - morning

"Aleko Konstantinov" X Primary school (Town Pernik)

Address: quarter of Iztok street: "Kl. Gotvald" No 2,
2304 Pernik

Phone: +359 (0)76 670850; +359 (0)76 670850;
+359 (0)76 670950

"Aleko Konstantinov" X Primary school is financed by the municipality primary (I - VIII class) school.

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"Elin Pelin" XI Primary school (Town Pernik)

Address: street: "Minsk" 1, 2304 Pernik

Phone: +359 (0)76 670310; +359 (0)76 670320; +359 (0)76 670340

e-mail: elpelin@abv.bg

www.schoolelpelin.bg

"Elin Pelin" XI Primary school is financed by the municipality primary (I - VIII class) school. Learning time: two shifts

"Vasil Levski" XII Primary school (Town Pernik)

Address: street: "Nikola Kozlev" 33, 2307 Pernik

Phone: +359 (0)76 60-84-89

E – mail : school _12pernik@abv.bg

"Vasil Levski" XII Primary school is financed by the municipality primary (I - VIII class) school. Learning shifts: one shift – morning.

"Sv. Sv. Kiril and Metodiy" XIII Primary school (Town Pernik)

Address: street: "Mladen Stoyanov" 2, 2303 Pernik

Phone: +359 (0)76 67-05-80

e mail – pk_13ou@abv.bg

"Sv. Sv. Kiril and Metodiy" XIII Primary school is financed by the municipality primary (I - VIII class) school. Learning shifts: one shift – morning.

"Sveti Konstantin Kiril Filosof" Primary school (Town Pernik)

Address: quarter Teva, 2309 Pernik

Phone: +359 (0)76 66-03-64; +359 (0)76 66-04-53; +359 (0)76 66-00-60

"Sveti Konstantin Kiril Filosof" Primary school is financed by the municipality primary (I - VIII class) school. Learning shifts: one shift - morning

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MUNICIPAL SECONDARY SCHOOLS

"Petko Rachov Slaveykov" V Secondary school (Town Pernik)

Address: quarter of Humni dol,street: "Georgi Mamarchev" No 2, 2300 Pernik

Phone: +359 (0)76 607042; +359 (0)76 607042; +359 (0)76 602330

Email: fivesouprs@pernik.net

V Secondary school "P.R. Slaveykov" is financed by the municipality secondary (I - XII class) school. Learning time: two shifts.

"Sv. Sv. Kiril and Metodiy" VI Secondary school (Town Pernik)

Address: street: "Krakra" No 69, 2300 Pernik

Phone: +359 (0)76 605425; +359 (0)76 605424;

e- mail: a_oliova@abv.bg

website: 6uciliste.webs.com

VI Secondary school is financed by the municipality secondary (I - XII class) school. Learning time: two shifts.

"Sv. Sv. Kiril and Metodiy" XVI Secondary school (Town Pernik)

Address: street: "Dimitar Blagoev" No 154,
2308 Pernik

Phone: +359 (0)76 69-01-20; +359 (0)76 67-01-90

Email: pernik_16sou@abv.bg

"Sv. Sv. Kiril and Metodiy" XVI Secondary school is financed by the municipality primary (I - VIII class) school. Learning time: 1 daily shift

"D-r Petar Beron" Secondary school (Town Pernik)

Address: street: "Otets Paisiy" No 10,
2300 Pernik

Phone: +359 (0)76 60-86-70; +359 (0)76 60-14-24; +359 (0)76 60-14-24; +359 (0)76 60-86-70;

Email: beron_pk@abv.bg

www.soupberon.hit.bg

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SOU "D-r Petar Beron" is financed by the municipality secondary (I - XII class) school with Advanced Study of Foreign Languages. Learning time: two shifts

"Hristo Smirnenski" High school (Town Pernik)

Address: street: "Monte Karlo" No 1,
2300 Pernik
Phone: +359 (0)76 60-66-15; +359 (0)76 60-25-42; +359 (0)76 60-87-66
E-mail:pmg_smirnenski@abv.bg
www.pmg-pernik.com

"Hristo Smirnenski" High school is financed by the municipality high (VIII - XII class) school. Learning time: two shifts.

"Simeon Radev" High school (Town Pernik)

Address: street: "Blagoy Gebrev" 17, 2304 Pernik
Phone: +359 (0)76 670140; +359 (0)76 670120
E- mail: gp4e@mail.bg
www.simeonradev.org

"Simeon Radev" High school is financed by the municipality high (VIII - XII class) school with foreign languages. Learning time: one daily shift.

High School of sports „Olimpiec“

Address: quarter Iztok, street: "Kl.Gotvald " 2, Pernik
Phone.:67-07-02 ; 67-00-60 ; 0894/659 746
High school of sports is financed by the municipality high (VIII - XII class) school with foreign languages. Learning time: one daily shift.

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STATE VOCATIONAL SCHOOLS

"Yuriy Gagarin" Technical Vocational school (Town Pernik)

Address: street: "Tarnovo" No 10, 2300 Pernik

Phone: +359 (0)76 600910; +359 (0)76 602613

Email: ptg_gagarin@mail.bg

Website**:** http://gagarin.atspace.com

"Yuriy Gagarin" Technical Vocational school is financed by the state high (VIII - XII class) school. Learning shifts: one shift - morning

"Hristo Botev" High school of Energy and Mining Industry (Town Pernik)

Address: street: "Silistra" No 10, 2302 Pernik

Phone: +359 (0)76 607783; +359 (0)76 606827; +359 (0)76 606568

Email: pgemphb@abv.bg

High school of Energy and Mining Industry "Hristo Botev" is financed by the state high (VIII - XII class) school.

"Arh.Yordan Milanov" High school of Engineering and Construction (Town Pernik)

Address: quarter of Moshino, street: "Mladen Stoyanov", 2303 Pernik

Phone: +359 (0)76 670010; +359 (0)76 670790; +359 (0)76 670780

Email: pgts@abv.bg

Website: http://www.pernik.net/tsa1/index.htm

"Arh.Yordan Milanov" High school of Engineering and Construction is financed by the state high (VIII - XII class) school of Engineering and Construction. Learning time: two shifts.

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"Maria Curie" Technological Vocational High school (Town Pernik)

Address: quarter of "Iztok", street: "Riga" No 1, 2303 Pernik
Phone: +359 (0)76 67-29-47; +359 (0)76 67-29-47; +359 (0)76 67-29-47; +359 (0)76 67-51-34
Email: tpg_mcurie_pernik@abv.bg
Website: http://www.tpg-mcurie-pk.hit.bg

"Maria Curie" Technological Vocational High school is financed by the state high (VIII - XII class) school.
Learning time: two shifts

High school of Economics (Town Pernik)

Address: street: "Georgi Mamarchev" No 2, 2302 Pernik
Phone: +359 (0)76 60-83-84; +359 (0)76 60-37-78
Email: pgi_pernik@abv.bg
Website: http://pgi-pernik.bg-schools.com

High school of Economics is financed by the state high (VIII - XII class) school. Learning time: two shifts

"Sveti Ivan Rilski" High school (Town Pernik)

Address: street: "Silistra" No 10, 2302 Pernik
Phone: +359 (0)76 607783; +359 (0)76 606827; +359 (0)76 606568
„Sveti Ivan Rilski" High school is financed by the state high (VIII - XII class) school. Learning time: two shifts

Of 30 municipal and state schools in Pernik Municipality officially invited to join in the study of energy consumption responded 22. Study and detailed analysis of energy consumption and consumption of cold water is presented in Section IV of this Report.

II. PURPOSE OF THE PROJECT

Visible and tangible climate changes are the biggest threats and challenges to the people. If the Earth temperature changes with more than 2 degrees over the levels before industrial epoch, there is a possibility to change the climate parameters permanently and consequences unpredictable and immeasurable. In the

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moment is running process of lowering CO_2 emissions and it is very important this to be stabilized until 2020 and to be decreased with 50% up to 2050 compared to the levels from 1990. After the scientist' warnings, that climate changes are getting troublous, the European union takes different measures in order to consolidate areas in one global climate and energetic policy. By this will be ensured competitive, stable and safe energy supply and together with good practice will decrease CO_2 emissions.

Energy efficiency discussions are getting within the framework of a wide range of priorities and goals of the European Union. Therefore, the subject of the project is to increase consumer awareness on energy efficiency by creating the necessary preconditions for reducing emissions of greenhouse gases from carbon dioxide CO2 and environmental protection. This will improve welfare in predetermination of the cross-border area by finding funding mechanisms for energy efficiency renovations and modernization of buildings in the education infrastructure.

The key elements of energy policy of European union for realization of these aims are:

- Liberalization and price transparency of energy markets;
- 20% share of renewable energy;
- Energy efficiency and approach for saving energy;
- International cooperation.

The easiest way to increase the security of energy supply and to improve the climate is to reduce energy consumption. This means to use energy more efficientlythat can minimize loses. This may be achieved by the energy-saving technology by changing habits and behavior, or a combination of both.

Energy saving has economic benefits: the EU's objective up to 2020 will reduce energy costs by € 100 billion per year.

This goal may seem difficult to achieve , but in practice there are many opportunities for more efficient use of energy, sometimes surprising to us at the cost of less efforts. For example, since 1990 by the energy labeling , by minimum efficiency standards and voluntary agreements, household appliances manufacturers have already reduced by 50% the energy consumption of a new refrigerator or freezer. For other appliances such as washing machines and dishwashers was achieved reductions exceeding 25%. International Programme Energy Star gives guidances on the most energy efficient computers and office equipment.

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Transport is an area where there is a huge untapped potential for improving energy efficiency, which is why the European Union / EU / work with car and fuel manufacturers to accomplish this task and to reduce CO2 emissions from vehicles. The European Union is also working on the infrastructure and policies to cut congestion. Congestion leads to unreasonably high cost of burning fuel.

The share of building maintenance is 40 % of the EU's energy needs. Application of more stringent standards for building envelope, integrated systems for lighting, heating , cooling and hot water will reduce the amount of energy consumption and will reduce emissions, due to wasteful heating and cooling and inefficient distribution systems for heating and cooling. The contribution of the research will also help in the creation of new, innovative insulation materials. Such measures have the potential to reduce energy consumption in buildings by up to 28% by 2020. This is equivalent to saving more than 10% of total energy consumption in the EU.

Large amount of energy is lost due to the use of energy-inefficient appliances. The EU therefore calls for more energy efficient appliances, enhancing energy labeling and creating minimum standards for energy efficiency.

Greater use of energy-efficient lighting in the streets, in offices, schools, shopping centers and homes is relatively easy to achieve. For example, the transition from "ordinary" light bulbs to "energy" reduces energy consumption by over 75%. Energy saving bulbs are more expensive, but the reduced monthly cost of electricity completely offset the initial cost .

Many of us use energy unnecessarily without realizing how wasteful is that. More detailed information about energy consumption provided by advanced meters at cars and homes will in future enable us to use energy more appropriate. However, this requires a change in habits and behavior

Unfortunately, the Commission found that energy efficiency in Bulgaria is significantly lower than the average in the European Union , although there are significant legislative progress.

Environmental education among students in the field of climate and energy saving can significantly change the attitude to the problem and people's behavior and help to improve the situation. Especially important is to show the ability of each person through his actions to save resources and energy, to reduce its own impact on the environment, reduce the human factor in climate change and protect the environment for ourselves and future generations.

Education on energy efficiency among students aims to raise awareness of rational use of energy in and out of school, and encourage them towards more efficient use of energy in daily life of students,

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teachers, parents, friends and others. From the digital clock in the morning up to turning off the light before sleeping, our workday is characterized by constant use of energy. Whenever cooking, traveling to school, listening to music or bathe, we consume energy. All this is related to the production of carbon dioxide / CO2 / or other harmful emissions, but also leads to cost money. We usually do not consider our everyday actions: turn on a light, driving, taking a drink from the fridge, but any small change in our behavior can lead to significant energy savings and reduction of emissions.

The overall objective of the project is to promote sustainable development, improving local prosperity by creating conditions for increasing energy efficiency in schools , increasing economic synergy in the region and improve the capacity for joint use of common regional potential for improving regional prosperity in particularly through the development of policy and social networks for cooperation in environmental protection and awareness of students through an active exchange of best practices on energy efficiency in the designated area for cooperation.

Specific objective is to be involved not only students but also their teachers, parents, neighbors, friends, representatives of local government and the Ministry of Education to undertake activities on energy savings. This enhances the interest and motivation of children.

Main objective of the project is Europe's children to get acquainted with the problems of global warming and the efficient use of energy , with the judicious use of finite energy sources, with different options for energy production from renewable energy sources /RES/ to understand their role and contribution to the protection of our environment and thereby creating a sustainable future for the planet.

III. ENERGY EFFICIENCY IN THE BUILDINGS

1. WHAT IS ENERGY?

Energy is a driving force in the universe. This is a physical quantity that determines the amount of power of a system to change the state of the surrounding environment or the ability to perform work.

2. HISTORY … for energy

Energy has a long history. Many years ago the fire was discovered as a tool for cooking, heating and scaring wild animals away from people.

Fire is the first major discovery of civilization. Woods are the main fuel for long periods of time in the development of civilization.

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Thousands of years ago, people learned also how to use the wind as an energy source. Wind is produced by the uneven heating of the sun on the earth's surface due to the difference in surface temperature of land and water. The hot air has a lower pressure than the cold and as the high -pressure attempts to equalize with the low pressure, wherein the process produces i.e. generate wind.

Around 1200 BC, in Polynesia, people learned to use wind energy as a driving force for their boat using sails.

About 5000 years ago, the magnetic energy is found in China. Magnetic force attracts iron objects, and also provides useful information on navigation as it always points north, as the reason for this is the Earth's magnetic field.

Electricity was discovered by the Greek philosopher Thales, about 2500 year. Thales has found that rubbing a piece of amber leather appears static force that attracts dust and other particles.

Around 1000 BC, the Chinese discovered coal and start to use them as fuel. They burn slower and longer than the wood and give more heat at a greater distance. Coal serve as an excellent fuel and continues to be used for centuries. When Marco Polo returned to Italy after the expedition to China in 1275 year, It presents coal of Western civilization

3. INTELLIGENT USE OF ENERGY AT SCHOOLS

It is developed guidance "Energy Efficiency in Buildings - Guide the student" version BG 1.0 - September 2010, the project IUSES Intelligent use of energy at school - "Intelligent Use of Energy at School", financed by the "Intelligent Energy Europe" the European Commission.

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4. BUILDING LIKE "BREATHING" BOX

The building can be seen as a box that is trying to protect their content from climate change, such as temperature, wind, rain, etc. Besides furnishing, interior comfort depends on two main factors: temperature and humidity. Obviously, the maximum discomfort we feel when we have a high temperature and high humidity.

"Skin" of the building called shell works as a heat exchanger with external weather conditions - receiving heat from the sun and heat (at work of ventilation or in situation of poor shell). In addition, t that need to cover and protect, the cover must allow the building to breathe, to prevent it from increasing moisture and take care of the balance between uptake and release of heat .

Why is this happening? This is a natural phenomenon known as "transfer of heat." According to him, "Heat always moves from warm to cold place."

To keep the comfort, it is necessary heat lost in the winter to be compensated with a heating system and the heat absorbed during the summer to remove with air conditioning. This leads to wastage of a lot of energy in most buildings. In Europe, approximately 70% of the energy consumed by households goes to maintain proper temperature in homes. Typically use natural gas for heating and electricity for almost all cooling systems.

Providing warmth to heat their homes during the cold seasons is the service with the highest energy consumption. If you need to reduce the heat through better insulation, better windows and insulated, heat recovery, passive uptake of solar energy and other resources, the heating system can gradually simplify and reduce the need for energy, and will also and reduce emissions of CO_2.

5. SHELL OF BUILDING - building materials

The use of appropriate building and insulating materials contribute to reduce the need for heating or cooling. Thus, to counteract the natural flow of heat. In other words - provides to keeping the internal temperature .

Insulating means all materials that are highly resistant to the passage of heat .

The main materials used for thermal insulation of buildings can be divided according to their origin :

• Plant: cork , wood fiber , flax , straw , etc.

• Mineral: glass fiber , metal carbides , glass foam, etc.

• Synthetic: polystyrene , polyurethane and phenolic foams , PVC and others.

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Also the insulating materials have different shapes . Furthermore, the solid insulation , and also has a "blanket" in the form of bricks or rollers scattered wood fibers, foams, etc.. They can be used together to provide better isolation, but this requires professional installation and proper manner of the combination.

Good thermal insulation can reduce heat transfer through walls, roofs and windows, and thus to contribute to:

• Energy savings because retain heat in winter and maintain lower temperatures in summer. Increased comfort by eliminating the so-called effect of the "cold wall ", which occurs external to the flat walls and the windows (the temperature difference between the wall surface and the inside of the room must not be greater than 4 ° C).

• Reduce the risk of condensation that can cause damage to the insulation and the structure of the building, and poor living conditions and mold. The risk of condensation increases with lower outdoor temperatures.

• Avoid sudden changes in temperature and protect the building from cracks and thermal expansions. In winter, every not isolated square meter wall loses energy equal to 3 to 6 liters of fuel (meaning the fuel that would be used to heat the room without insulation). With good insulation, these losses can be reduced to a sixth. Doubling the wall insulation from 45 mm to 90 mm can save about 30 % of energy.

• Improve the acoustics of the building.

For buildings that are more than 20 years, it is recommended renewing and improving the insulation, which could easily achieve 50% lower energy consumption.

6. BUILDING OPPENINGS – WINDOWS AND DOORS

Windows, glass windows and doors are the weakest points in the shell of a building and approximately one third of the heat loss and cooling due to them. External doors contribute to the loss of approximately 10 % of the heat in a home.

The windows are measured by thermal transmittance coefficient U. U is the opposite of the coefficient R (thermal resistance), and if the U is lower, than the contribution to the energy efficiency of the building from the window is better .

U ≈ 4 W/m^{2}K single window glass, aluminum frame

U ≈ 3 W/m^{2}K single window glass, wooden frame

U ≈ 2 W/m^{2}K double layer window glazing, aluminum or PVC frame profile

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U ≈ 0,5-1 W/m^{2}K window double-layer or three-layer glass , aluminum or PVC frame profile , inert gas volume between the panes .

Double-pane windows /double layer glazing/ have up to 75 % lower values of the coefficient U, than single windows. The most efficient double-glazed windows allow 80% debris sunlight to enter the room compared to single and have an estimate of the coefficient of heat transfer U ≈ 2 W/m2K. Windows values of the coefficient of heat transfer U ≈ 1 W/m2K or lower in some EU countries are popular with the name "super windows". Many of the commercially available high-performance windows may have: more than two rows of windows; coatings for low emission of light (so-called low -e); fill volumes between panes with inert gas.

The glazing is one of the most important factors in achieving energy savings. 60% glazing of buildings facing south, can achieve energy savings of 15% to 40%, depending on the insulation. The disadvantage in this case is that such a design requires 55% more cooling in the summer. So usually installed sheds or inculcated trees to prevent direct exposure to sunlight.

7. INTEGRATED BUILDING SYSTEMS

• HEATING

Ensuring good ventilation is a very important factor (even more important than the thermal insulation) when trying to avoid the use of air conditioning in the summer.

Thermal comfort is one of the main factors which ensure optimum internal environment for people. This is a condition in which the temperature balance between man and his environment is preserved.

The main criteria related to thermal comfort is working temperature (this is the air temperature affected by radiation to the surrounding surfaces) , humidity and air velocity.

It has been shown that thermal comfort has a great influence on the subjective feeling of comfort and work activity than the polluted environment and strong noise. Some studies show that a person reaches 100% efficiency (for light work) at a temperature of 22°C. At a temperature of 27°C, productivity dropped to 75% and at 30°C it is only 50% of the maximum.

The humidity is closely related to temperature. In winter, the relative humidity drops to 20% or even less. This leads to drying of the mucous membrane of the respiratory tract, the protective effect of the organism belongs, and thus may be caught of harmful substances in the respiratory tract.

Optimal temperature of residing in different buildings in purpose is as follows:

19.5 ^{0}C - administrative buildings

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18.5 ^{0}C - schools, gyms

21 ^{0}C - hospitals

19.5 ^{0}C - polyclinics and diagnostic consultative centers

21-22 ^{0}C - buildings

20-21 ^{0}C - hotels

19.5 ^{0}C - commercial buildings, shops

• COOLING

Cooling systems allow to maintain comfortable low temperatures in buildings during the warmer seasons. Relatively new one can afford yourself to choose the temperature in your home. This is because, in recent years the cost of a cooling system constantly falls, leading to their wide distribution. Unfortunately the majority of the buildings have not such centralized systems (which would make them more energy efficient), and most of them install single units for individual apartments and rooms.

Function of refrigeration or air conditioning systems is to transport heat from one place to another in the commission of a job - in this case electricity consumption. This is similar to the exchange, in which the hot air from inside the room is taken, cooled and the heat is removed out of the room.

As a result, the cooling systems seriously increase electricity bills for hotels, hospitals, schools, office buildings and more. In many European regions where temperatures are higher, electricity bills in the summer are higher compared to winter precisely because of the use of cooling systems.

The temperature of the cooling systems in summer must be regulated so that person does not feel cold when entering the room. Although this can be a temperature below 18ºC, it must be maintained in the range 23ºC to 25ºC.

The efficiency of an air conditioner in cooling mode is determined by its energy efficiency ratio (EER - Energy Efficiency Rating). It is equal to the ratio of the output (taken from the refrigerator heat) in relation to kW electric power consumption in kW in cooling mode. For example, if air conditioning gives 3,43 kW cold and consumes 0,87 kW electric energy, it has EER = 3,943.

EER = (energy consumption / energy dedicated)

It is similar energy efficiency ratio of an air conditioner in heating /COP - Coefficient of performance/. As this ratio is higher , so an air conditioner is more economical /efficient/ .

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Older conditioners have EER e.g. about 2.2 , while the new ones are of approximately 3.5. This means that the cooling of the same room on equal terms, the old air conditioner will use 60% more energy.

In the attached data are presented below the limit values of the coefficient EER, which determines the class of energy consumption of an air conditioner .

Energy class A 3.20 <EER

Energy class B 3.20 ≥ EER> 3.00

Energy class C 3.00 ≥ EER> 2.80

Energy class D 2.80 ≥ EER> 2.60

Class energy E 2.60 ≥ EER> 2.40

Class energy F 2.40 ≥ EER> 2.20

Class energy G 2.20 ≥ EER

In most cases, a fan can achieve approximately the same comfort as air conditioning. They lead to thermal sensation by 3° C to 5° C lower than the actual room and have significantly lower power consumption (almost 10 % lower than that of the air conditioner)

Types of air conditioners:

- Indoor air

They are designed for cooling single rooms. Working with them and installation is easy, but their efficiency is low. Most common are the so -called "split-system" . They evaporator is inside the room and the condenser is located outside. Both sections are connected with a conduit in which the cooling liquid circulates. When the evaporator and the condenser are in one body - conditioners are called "combo system" - an example of such systems are the window air conditioners.

- The central cooling

With these systems use ducts installed throughout the building, through which cold air and warm lead. Most centralized systems actually are "split systems".

Using the air conditioner during the summer months can lead to a significant increase in the cost of electricity - about 50%.

Use the following recommendations to increase energy efficiency and save money:

- Avoid using the air conditioning when possible:

- In most cases, the use of a fan will create the same sense of comfort such as air conditioning .

- Avoid the use of additional devices: too lighting, appliances that emit heat, etc. .

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- The placement of sheds and tents will restrict the flow of solar heat in summer.
- Suitable choice of parameters in air;

• DOMESTIC HOT WATER - DHW

Provide hot water for domestic use is the second consumer of heat in a building. Consumption depends on the habits of the person and varies across countries and households.

Minimum consumption of one person per day assuming 40 liters, equivalent to 2 kWh. The average consumption is about 3,4 - 4,0 kWh per person , which includes losses in the transmission network.

One of the first steps we can take energy efficiency is to reduce the leakage of hot water. Dripping 10 drops per minute is equivalent to 40 liters of water per week.

Major part of water and energy is lost in the mixing of water from the sink. Large amounts expires without using until the desired temperature is fixed. Here's a tip that in the long run can save a significant amount of water and energy. When you are ready to use the sink, put the first cold water due to stay in the pipes is about 20 0C and then set the desired temperature by adding hot water. Thus, savings of gallons of water that aggregate per year result in considerable savings.

Usually wasting water while let it run without using it. For example, while soaping hands while brushing our teeth while using shampoo or shaving. Another tip is to use gloves when work involving serious pollution. When brushing teeth can be used a glass of water instead of gallons flow channel.

Installation for DHW heating through solar systems this way to get hot water is one of the main applications of solar energy. The main advantages are that solar energy is available, its use is not associated with additional costs and systems can be retrofitted in already constructed buildings.

Advantages of solar systems:

- Provide 50-70% of the annual consumption of hot water;
- 20-30 years of operation;
- Reduce hot water accounts for almost half;
- Provides approximately 100 % of the hot water in the summer;
- Works even with Clear;
- Easy installation planning.

The only drawback here is the high cost of the installation itself and "payment" over time is slow and very dependent on the intensity of solar energy that cannot be foreseen.

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• LIGHTING

People need adequate lighting to see and work. Essential requirement for interior spaces is visual comfort .

Natural light is very important. If it is not used daily sight of a man can fail. Therefore it is used as the main source of light in the hours when possible. Daylight is one of the factors of the environment and has a great impact on the physical and mental state of a person.

The predominance of daylight reduces electricity consumption and hence costs. In cases where it cannot provide daylight is necessary to use artificial sources. Modern sources of artificial lighting can provide light with properties similar to those of natural daylight.

Semi-direct lighting occurs when a small portion of light 10-40 % spread up to the ceiling. Thus it reflects and creates better lighting with softer shadows and avoiding unpleasant glare. This method of lighting is the most optimal and applied in the largest number of cases.

Artificial lighting consumes a significant amount of energy in the world. In households between 20-50 % of all energy consumed falls on the lights. In some buildings, 90% of energy consumption for lighting is because of excessive lighting. In many cases there are ways to make full use of light.

Here are some examples to reduce the need for electricity for lighting:

- Just down the lighting needs for each part of the building.

- Analysis of the quality of light.

- Planning of housing and interior design (wall surface geometry of the rooms), consistent with the lighting.

- Designed using the maximum amount of daylight.

- Selection of lighting, which is the best technology for energy saving.

- **ELECTRICAL APPLIANCES**

Man is surrounded at school, office or home electric appliances and devices used in their daily lives. Sometimes we're used to with their use that we forget to pay attention to the use of electricity.

In Europe, electrical appliances use about 8% of the energy needed by a household. The percentage is much higher if we consider electricity. Consumption of all devices for a home represents about 55% of the total power consumption.

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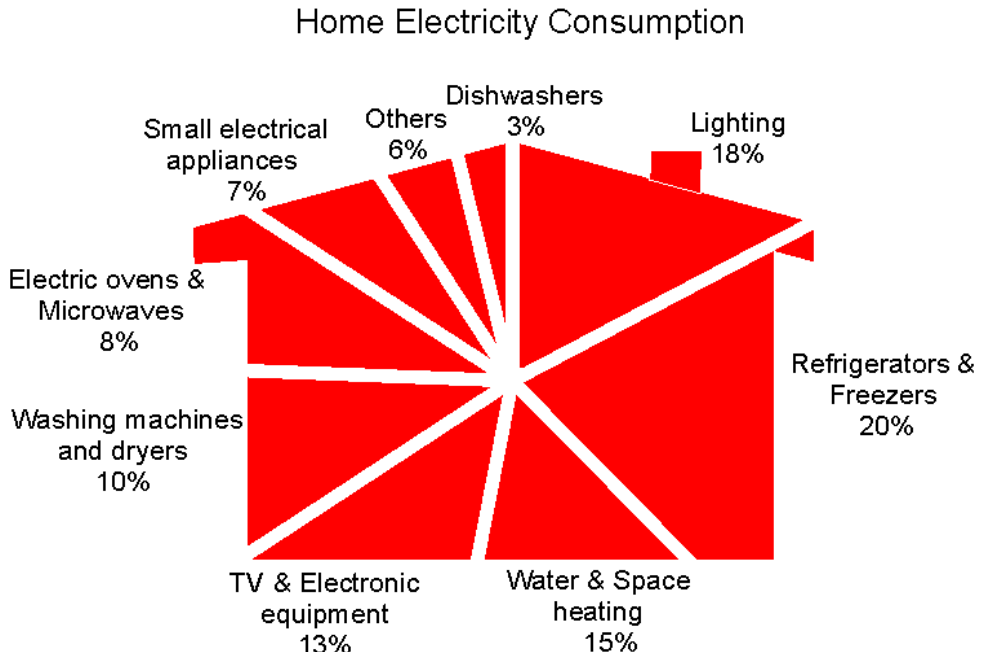
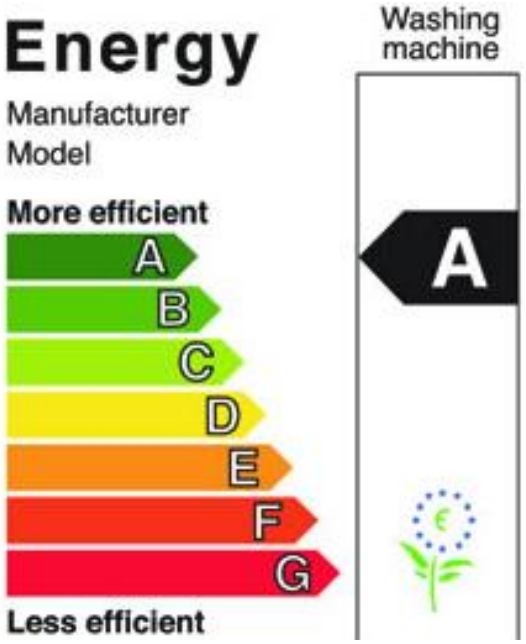


Do you know what an Energy Label is?

One of the main aims of the EU Energy Label is to help householders make informed decisions about the purchase of energy-consuming appliances. It is also an incentive for manufacturers to improve the energy performance of their products. The Energy Label is compulsory only for a certain group of products, light bulbs, cars and most electrical appliances (e.g., refrigerators, stoves, washing machines, as listed above). The other appliances, which have lower power in general, are not covered by the Energy Label. Some of them are: toasters, fans, clothes irons, blenders, etc.



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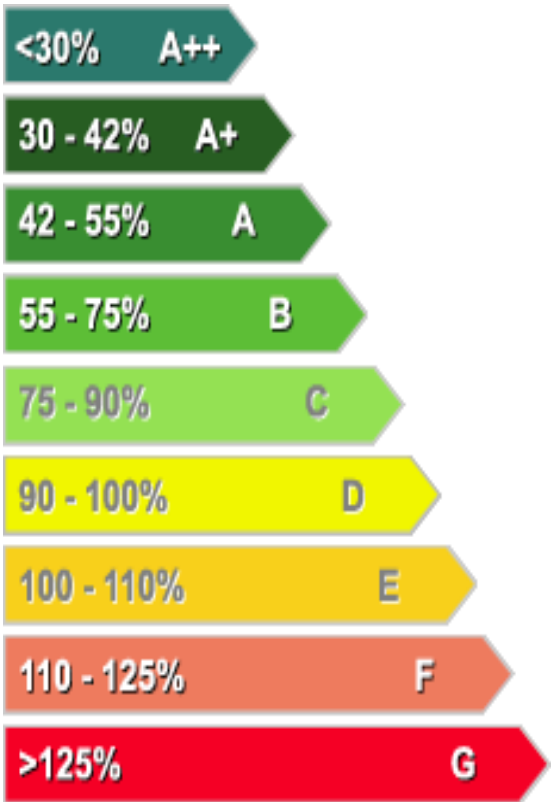
What information reveals the label of an electrical device:

The energy consumption figure shows you the units of electricity use in kWh to allow comparisons between models. Each letter that is lower in the scale, away from A, means an increase in energy consumption by about 12–15% more than the letter that precedes it. Thus, we can say that, for instance, a washing machine of ”Class A” consumes up to 24% less than one of equal benefits and class C, and up to 36% less than a Class D.



Only in the case of cold appliances (refrigerators, freezers, etc.), must you add two rows from the top, to include Class A+ and Class A++, expressing an even lower relative consumption. Therefore, if you consider that the useful life of a home electrical appliance is more than ten years, the energy savings to be gained are very important.

Consumption of electricity

When you use electricity to watch TV for an hour uses 150 watt-hours of electricity. Also 1000 Wh (watt-hours) equals 1kWh (kWh) . It is also important to bear in mind that many of the devices have adjustable operating modes (volume and contrast of the TV temperature of the air conditioner, etc.) So that the actual consumption of power consumption depends on the setting of the unit. This means that if an appliance is not working at full capacity, the electricity consumption will be calculated a bit more complicated than multiplying the labeling of the device power and run time. In these cases, power consumption will be less, and is determined by the so-called. "Consumption factor" *, which is a unit operating at full power or less than one, if the power is below the maximum.

In other words - consumption is obtained by multiplying the power at the time in which the device is used.

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In Europe, the average price for households is 20 cents per kWh. The average annual consumption per household is 4,500 kWh, which is expressed in money is € 900 per year.

Many appliances continue to use electricity even when turned off. This occurs when appliances such as TVs, computers, music systems, etc., and can be avoided by excluding from the socket.

This "phantom consumption" increased consumption of the device with a few watt-hours and can be avoided if you put the key chain to which they are included and thus excluded all together after use.

Refrigerators

These appliances are working on 8760 hours per year (constant), their consumption is greatest.

Advice on refrigerators and freezers:

- Pay attention to the energy labels when buying and choose those of Class A+ or Class A++.
- Select a new refrigerator that is an appropriate size for your needs. As larger is, the greater is its consumption.
- Do not place hot food in the refrigerator.
- If you need to defrost food from the freezer is better to leave it to thaw in the refrigerator. So the refrigerator will use its low temperature.
- Make sure the doors are closed and adhere firmly without allowing air to penetrate into the refrigerator. Try a piece of paper, placing it between the door and the main body. If you can remove it after you close it probably insulation is damaged.
- Close doors as quickly as possible.
- Do not install the refrigerator in warm areas, and those with poor ventilation.
- Do not keep too low temperatures. Recommended are 5 ° C for the refrigerator and -18 ° C freezer.

Hints and tips:

Can take some measures to reduce the energy consumption of home electronics:

- Unplug the appliance. The most efficient and simple way is to unplug appliances when they are not in use. Take a look about forgotten chargers that are not used or incorporated electronics not in use. When you charge the mobile phone, remove the charger from the socket after.
- Use power strips (with off switch). Turn on a TV, sound system and DVD player in one strip and when they are not in use you can switch them off together.

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Tips on computers:

- Turn off the monitor when not using the computer - even for small spaces.
- Use a black screen-saver- they consume the least energy.
- Must be used in settings mode depending on consumption (low power "sleep mode"). Windows and Macintosh have default settings and "waking up" the computer is done only by the touch of a button or mouse movement.

8. INTERESTING FACTS

About 80% of the energy used worldwide is derived from fossil fuels and the burning of fossil fuels in order to produce heat, leads to the release of carbon dioxide and other emissions of harmful gases in the atmosphere, which are considered eligible for the cause of global warming.

As a by-product of electricity annually emitted into the atmosphere approximately 80 tons of mercury. A curious fact is that mercury is the most toxic heavy metal released into the atmosphere.

About 70-90 % of the total amount of released air emissions come from transport. Approximately 45-50 % of the total NOx emissions emitted annually into the atmosphere are contributing to transport. About 66% of carbon dioxide emissions are emitted by transport due to the combustion of gasoline, 16% diesel and 15% of the utilization of other fuels.

Transport as a sector consumes about 35% of total energy consumption. 95% of transportation in the world is dependent on oil.

Glass bottle is broken for 1 million years.

The extraction of fossil fuels is 100,000 faster than the time required for their formation.

The sun's rays provide one hour as much energy as the entire population of earth consumes in a year.

Countries with highly developed economies consume about 30% of total world energy consumption.

Rapid population growth and the rapid pace of development of the world economy will lead to a rapid increase in energy consumption worldwide.

It is expected that global energy consumption will increase by 40% to 50% by 2020. , And the world's energy reaching: from renewable sources (18%), nuclear (4%), fossil fuels (78%) ; global discharge of carbon dioxide in the atmosphere is also expected to increase to 50%.

A curious fact is that the American population represents approximately 5% of the entire population of the Earth, and consumes about 26% of total world energy consumption.

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20°C is the optimal etc. ideal room temperature. In exercising proper control and maintain your heating costs will be reduced ie reduced by about 10-20 %.

Achievable goal is to reduce energy consumption in your home by about 30 % if you purchase energy efficient equipment and appliances!

It is a fact - 40% of the total energy consumed in your home's heat.

The energy contained in lightning is enough to toast 160,000 slices of bread!

For each minute that the freezer door has been opened, take 3 minutes, then the closure and, on reaching the set temperature of the freezer!

About 15% of the heat energy it consumes your household is lost through Leaky areas of contact between the windows / doors, windows and cabinets / walls and fencing.

Up to 10% you can reduce your costs for heating your home, if you put insulation system of external walls, floor and ceiling, as well as seal the connection between the windows and exterior walls, seals on doors and windows and minimize the possibility of a thermal bridges.

A curious fact is how the choice of decorative paint in the interior can affect consumption of energy. White walls reflect 80% of the light falling on them. Black walls reflect only 10%.

House dust accumulated on the light source / light bulb or contaminated glass windows / can reduce the flow of light by about 10 %.

About 90 % of the energy consumed by a dishwasher goes to heat water.

Washing machines and dishwashers consume about 25% of total energy consumption in a household.

Every time you open the door of the stove, in the mode of cooking, you lose about 25-30 % of the temperature in the oven.

Microwave household appliances consume on average 50% less energy than the energy consumed by conventional household appliances.

About 10% of the total cost of your energy bills come from appliances in your home, left in "sleep" mode . These are computers, televisions, audio systems and more.

AVG 16 million tons of carbon dioxide emitted to the atmosphere every 24 hours.

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9. ENERGY SOURCES

• FOSSIL FUELS

Solid fossil fuels are used for heating in the past. These are mostly coal, brown coal, anthracite and coke. Their use is a major cause of air pollution. The combustion of these fossil fuels leads to the formation of the emissions of sulfur, nitrogen and carbon oxides, removal of dust, as well as organic and inorganic compounds.

In the past, these sources have been difficult for control . Also combustion efficiency was low, and emissions were high. Modern boilers are highly efficient and have less emissions. It should be remembered also that fossil fuels are not a renewable source of energy and that their quantity is limited. In some countries, are popular also liquid fuels.

• NATURAL GAS

Nowadays most fuel used is natural gas. The gas has many advantages compared to other fuels. Compared to fossil fuels, the combustion of gas emit far fewer emissions. Removal of dust and sulfur dioxide (SO2) is almost negligible, and the amount of carbon monoxide (CO) is much less. The only problem is when burning gas that emit nitrogen oxides (NOx), but nowadays they are controlled successfully and their quantities have been reduced to 10% from previous values. European standards separate heating systems into five groups depending on the emission of NOx. Gas like every other carbon fuel source and carbon dioxide (CO2), which is considered nowadays as the main cause of the greenhouse effect

• ELECTRICITY

Electric heating is the most comfortable heat in terms of installation, maintenance, thermal comfort and response time. Another great advantage is that it is available almost everywhere. As a disadvantage can be pointed very high cost of electricity, and it is most commonly produced by the combustion of fossil fuels.

• RENEWABLE ENERGY SOURCES - RENEWABLES

• BIOMASS

Biomass represents organic matter. Usually these are wood or wood waste, straw, grain and other agricultural waste. Biomass may also include biodegradable wastes (such as animal manure) to be incinerated.

Key technologies used in the process of conversion of biomass are called dry process - incineration, gasification and pyrolysis, and wet process - biochemical transformations such as fermentation to methane fermentation to ethanol and bio - hydrogen. To a separate group fell a relatively new technology for the production of fuel (mechanical -chemical conversion) by extraction of vegetable oils and their transformation . Thus was obtained a bio- fuel.

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When properly burning wood or straw, this can be seen as the second most environmental "clean" fuel. Only dirt is expressed as the separation of nitrogen oxides and relatively low solids. The timber does not contain sulfur, and at the straw, it is only 0.1 %.

• HEAT PUMPS

Heat pumps are slowly becoming popular nowadays. The rising cost of energy is causing more and more often to be installed in residential buildings (especially family ones).

The heat pump is an electric device that does not produce heat, but only transfers it from the wire to the lower body at a higher temperature. It converts the thermal energy of water, soil and air with a lower temperature in the heat at a higher temperature which can be used for heating.

Key elements of heat pumps are closed cooling systems, compressors and two heat exchanger units - condensation and evaporation.

The principle of operation of the heat pump is similar to that of a refrigerator. In the refrigerator via the evaporator inside the chamber to dissipate the heat from the products, and the condenser (on the outside of the rear face of the refrigerator) transfers it to the surroundings.

The circulation of the heat takes place here on the same physical laws, but the direction of heat transfer is reversed. The closed cooling system circulates coolant, which in turn goes through phases of evaporation and condensation.

Upon expansion of the coolant in the heat exchanger absorbs heat from the surrounding area and it goes in the gas phase. The compressor sucks the money from the evaporator of the heat agent and compresses them to high pressure. Vapor condensed in the heat exchangers and thus heat is released . The heating output of the heat pump is the sum of electric power consumed by the compressor and the potential energy of the environment.

Heat factor COP = (heat produced / imported electricity)> 1

The heat factor usually varies between 2.5 and 3.5 . This means that 1 kWh of electricity we get from 2,5 to 3,5 kWh heat . In some cases it may reach 4-5 kWh. The heat pump is appropriate when temperature differences among high. Heat pump operation is not associated with any harmful emissions.

Water use

They can be used as ground, and conventional sources. The main requirements are the water is clean, be above +8 ° C and in sufficient quantity.

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Geothermal

The heat from the soil can be easily used in the tube absorber. Heat is extracted indirectly - for this purpose should have transmission medium between the evaporator and the soil, where is commonly used refrigerant. The absorber consists of a plastic tube which is mounted vertically. The output is adjusted by the depth of the pipe.

Using air

In this case, the air from the environment, which contains enough heat, passes through the evaporator. This source is easily accessible, unlimited and does not affect the environment. The disadvantage is that the changes of the ambient temperature reflects the system performance.

• SOLAR ENERGY

Climate change, air pollution and generally critical state of the environment occurred primarily as a result of the use of fossil fuels as an energy source. This requires the development of new alternatives for electricity production, the well-known renewable energy sources - renewables. One of these is solar energy, which is the sun. It is free, inexhaustible, and can be used in various ways.

Every day the sun sends huge amounts of energy in the form of radiation. Like other stars, the sun is a big ball of gas (mostly hydrogen and helium atoms), which are in constant combustion process. Simply hydrogen atoms fuse to form helium (Fusion process). Exactly four hydrogen nuclei are necessary for the preparation of a helium atom. Thus, the resulting helium contains less hydrogen than material used for the reaction. This loss of matter is precisely the emission energy radiation from the sun - the source of life on Earth.

Active systems use different types of solar collectors and can be an additional source of heat. Their use depends a lot on their location, time during which the sun is shining and its intensity. Accumulated heat can be used to heat domestic water, and space heating.

• PHOTOVOLTAIC ENERGY

The word "photovoltaic" comes from two words "photo" which in Greek means light and "volt" unit of measurement of electrical potential.

Photovoltaic systems use cells to capture and convert solar radiation into electricity. The cells consist of one or two layers of semiconducting material. When light shines on the cell, it induces an electric field in the layers and thus conduct electricity. As greater is the intensity of the light, so the flow of electricity is larger.

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Currently the PV (photovoltaic - PV) cells that are used converted only 6-15 % of solar energy into electricity. Even if it does not seem so, this is one good performance, high hopes in these technologies. In recent years, scientific studies have advanced a lot, especially in the use of new materials with better opportunities for photovoltaic conversion.

Over 95% of all the solar cells produced in the world are composed of the semiconductor material silicon. The second most abundant element in the earth's crust, silicon is available in abundant quantities and its further processing does not adversely affect the environment. Photovoltaic systems can operate in the absence of bright sunlight.

Electricity is generated and in cloudy weather. Due to the reflection of light even in slightly cloudy days, the electricity produced can be more than in clear weather.

The most important part of a PV system are the cells. Multiple cells together form the solar panels, modules or arrays.

Most often, the PV cells are made from crystalline silicon. Used in several forms - monocrystalline (Cut pieces of a crystal), polycrystalline (group silicon crystals) or amorphous (by mixing silicon with other semiconductor materials). Their effectiveness varies from 12 to 17%, and these processes constitute 90% of the market today.

When refitting to consider the following three aspects:

- Orientation: solar systems must be oriented as in the south (if located in the northern hemisphere of Earth);
- Tilt (angle): PV modules must have a slope that leads to perpendicular sunshine at noon. This angle depends on the geographic location of the installation site. In Europe, the optimum slope varies in the range of 26ºC to southern Greece to 48ºC (or even more) for the Nordic countries. The reason for this is that in the south the sun moves longer perpendicular to the ground and, if the modules are mounted almost horizontally will get more energy. Conversely, the sun in the north has a lower path, and the modules have to be at a greater angle to obtain a horizontally long irradiation. The same goes for the seasons - the sun is higher in summer and lower in winter.
- Shadows: obtaining shadow falling on the solar system should be avoided. These are shadows caused by buildings of mountains, trees, etc. Each shade will affect energy production, reducing it substantially.

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IV. ANALYSIS OF ENERGY CONSUMPTION OF PRIMARY, SECONDARY AND VOCATIONAL SCHOOLS IN THE MUNICIPALITY OF PERNIK

MUNICIPAL PRIMARY AND SECONDARY SCHOOLS		
1	PRIMARY SCHOOL „Sv. Ivan Rilski “	Pernik,quarter „Monte Karlo”, #1 Monte Karlo str.
2	VII PRIMARY SCHOOL „Georgi Sava Rakovski “	Pernik,quarter “Mogiliche“, #14 Stara planina str.
3	VIII PRIMARY SCHOOL „Krakra Pernishki“	Pernik,quarter „Klepalo“
4	IX PRIMARY SCHOOL „Temelko Nenkov“	Pernik,quarter „Tvurdi livadi“
5	X PRIMARY SCHOOL „Aleko Konstantinov“	Pernik,quarter „Iztok“ , #2 Kl.Gotvald str.
6	XI PRIMARY SCHOOL „Elin Pelin“	Pernik,quarter „Iztok“ , #1 Minsk str.
7	XII PRIMARY SCHOOL „Vasil Levski“	Pernik,quarter “Mogiliche“,#33 Nikola Kozlev str.
8	XIII PRIMARY SCHOOL „Sv. Sv. Kiril i Metodiy“	Pernik,quarter „Moshino“, #2 Mladen Stoyanov str.
9	PRIMARY SCHOOL „Sv. Konstantin Kiril Filosof“	Pernik,quarter „Teva“
10	XIII PRIMARY SCHOOL „ Sv. Sv. Kiril i Metodiy “ – affiliate	Pernik,quarter „Moshino“, #1 Riga str.
11	V SECONDARY SCHOOL „Petko Rachov Slaveikov“	Pernik,quarter “Humni dol“, #2 Georgi Mamarchev str.
12	VI SECONDARY SCHOOL „ Sv. Sv. Kiril i Metodiy “	Pernik,quarter “Reno“, #69 Krakra str.
13	XVI SECONDARY SCHOOL „ Sv. Sv. Kiril i Metodiy “	Pernik,quarter ”Curkva“, # 154 Dimitur Blagoev str.
14	SECONDARY SCHOOL „Dr Petar Beron“	Pernik,quarter “Reno“, #10 Otets Paisiy str.
15	PRIMARY SCHOOL „Hristo Botev“ – Batanovci town	Batanovci, #19 „Sv. Sv. Kiril i Metodiy“ str.
16	“Hristo Smirnenski“ High School	Pernik,quarter „Monte Karlo”, #1 Monte Karlo str.
17	“Simeon Radev“ High School	Pernik,quarter „Iztok“ , #17 Blagoy Gebrev str.
18	High School of sports „Olimpiec“	Pernik,quarter „Iztok“ , #2 Kl.Gotvald str.
19	PRIMARY SCHOOL „Sv. Kliment Ohridski“	Village Kladnica
20	PRIMARY SCHOOL „ Sv. Sv. Kiril i Metodiy “	Village Divotino
21	PRIMARY SCHOOL „Otets Paisii“	Village Yardjilovci
22	PRIMARY SCHOOL Village Dragichevo	Village Dragichevo
23	PRIMARY SCHOOL Village Studena	Village Studena
24	PRIMARY SCHOOL „ Sv. Kliment Ohridski “	Village Rudartci
STATE VOCATIONAL SCHOOLS		
25	"Yuriy Gagarin" Technical Vocational school	Pernik, # 10 Turnovo str.
26	"Hristo Botev" High school of Energy and Mining Industry	Pernik,quarter “Dimova maxala“, # 101 Silistra str.
27	"Arh.Yordan Milanov" High school of Engineering and Construction	Pernik,quarter „Moshino“
28	"Maria Curie" Technological Vocational High school	Pernik,quarter „Moshino“, #1 Riga str.
29	High school of Economics	Pernik,quarter “Humni dol“, #2 Georgi Mamarchev str.
30	"Sveti Ivan Rilski" High school	Pernik,quarter “Dimova maxala“, # 101 Silistra str.

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#	School	Adress	Residents		Learning time	Year of construction
			Adults	Children		
MUNICIPAL PRIMARY AND SECONDARY SCHOOLS						
1	PRIMARY SCHOOL „Sv. Ivan Rilski “	Pernik,quarter „Monte Karlo”, #1 Monte Karlo str.	86	990	two shifts	1947-1954
2	VII PRIMARY SCHOOL „Georgi Sava Rakovski “	Pernik,quarter “Mogiliche“, #14 Stara planina str.	40	237	one shifl	1965
3	VIII PRIMARY SCHOOL „Krakra Pernishki“	Pernik,quarter „Klepalo“	22	160	one shifl	1964
4	IX PRIMARY SCHOOL „Temelko Nenkov“	Pernik,quarter „Tvurdi livadi“	46	368	two shifts	1939
5	X PRIMARY SCHOOL „Aleko Konstantinov“	Pernik,quarter „Iztok“ , #2 Kl.Gotvald str.	40	415	one shifl	1985
6	XI PRIMARY SCHOOL „Elin Pelin“	Pernik,quarter „Iztok“ , #1 Minsk str.	85	717	two shifts	1957
7	XII PRIMARY SCHOOL „Vasil Levski“	Pernik,quarter “Mogiliche“, #33 Nikola Kozlev str.	22	174	one shifl	1968
8	XIII PRIMARY SCHOOL „Sv. Sv. Kiril i Metodiy“	Pernik,quarter „Moshino“, #2 Mladen Stoyanov str.	45	356	one shifl	1973
9	PRIMARY SCHOOL „Sv. Konstantin Kiril Filosof“	Pernik,quarter „Teva“	35	247	one shifl	1998
10	XIII PRIMARY SCHOOL „ Sv. Sv. Kiril i Metodiy “ – affiliate	Pernik,quarter „Moshino“, #1 Riga str.	Did not provide data			
11	V SECONDARY SCHOOL „Petko Rachov Slaveikov“	Pernik,quarter “Humni dol“, #2 Georgi Mamarchev str.	43	350	two shifts	
12	VI SECONDARY SCHOOL „ Sv. Sv. Kiril i Metodiy “	Pernik,quarter “Reno“, #69 Krakra str.	Did not provide data			
13	XVI SECONDARY SCHOOL „ Sv. Sv. Kiril i Metodiy “	Pernik,quarter ”Curkva“, # 154 Dimitur Blagoev str.	Did not provide data			
14	SECONDARY SCHOOL „Dr Petar Beron“	Pernik,quarter “Reno“, #10 Otets Paisiy str.	67	780	two shifts	1923
15	PRIMARY SCHOOL „Hristo Botev“ – Batanovci town	Batanovci town, #19 „Sv. Sv. Kiril i Metodiy“ str.	Did not provide data			
16	“Hristo Smirnenski“ High School	Pernik,quarter „Monte Karlo”, #1 Monte Karlo str.	46	466	two shifts	1947-1954
17	“Simeon Radev“ High School	Pernik,quarter „Iztok“ , #17 Blagoy Gebrev str.	64	691	one shifl	1952
18	High School of sports „Olimpiec“	Pernik,quarter „Iztok“ , #2 Kl.Gotvald str.	25	128	one shifl	1985
19	PRIMARY SCHOOL „Sv. Kliment Ohridski“	Village Kladnica	Did not provide data			
20	PRIMARY SCHOOL „ Sv. Sv. Kiril i Metodiy “	Village Divotino	Did not provide data			
21	PRIMARY SCHOOL „Otets Paisii“	Village Yardjilovci	Did not provide data			
22	PRIMARY SCHOOL Village Studena	Village Studena	Did not provide data			
23	PRIMARY SCHOOL Village Dragichevo	Village Dragichevo	19	105	one shifl	1958
24	PRIMARY SCHOOL „ Sv. Kliment Ohridski “	Village Rudartci	16	50	one shifl	1980
STATE VOCATIONAL SCHOOLS						
25	"Yuriy Gagarin" Technical Vocational school	Pernik, # 10 Turnovo str.	35	315	one shifl	1959
26	"Hristo Botev" High school of Energy and Mining Industry	Pernik,quarter “Dimova maxala“, # 101 Silistra str.	21	268	one shifl	1956
27	"Arh.Yordan Milanov" High school of Engineering and Construction	Pernik,quarter „Moshino“	60	474	one shifl	1975
28	"Maria Curie" Technological Vocational High school	Pernik,quarter „Moshino“, #1 Riga str.	24	140	one shifl	1960
29	High school of Economics	Pernik,quarter “Humni dol“, #2 Georgi Mamarchev str.	64	575	two shifts	
30	"Sveti Ivan Rilski" High school	Pernik,quarter “Dimova maxala“, # 101 Silistra str.	39	360	one shifl	1956

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In applications an integral part of this report presents information analyzed data provided by 22 schools in Municipality of Pernik to Annual electro-energy consumption, kWh/y; Annual heat-energy consumption (local heating installation), kWh/y; Annual primary-energy consumption, kWh/y; Annual water consumption m^3/y; Specific annual electro-energy consumption, kWh/m^2; Specific annual heat-energy consumption (local heating installation), kWh/m^2; Specific annual primary-energy consumption, kWh/m^2; CO_2. Only for schools with existing information Annual energy savings after ESM, kWh/y; Share of savings, %; Rediced CO_2, t; Required investments valuie, BGN; Payback period,years - Addendums № 1, 2, 3, 4 and 5 to report.

In the table given below in this report provides information on nine schools in the Municipality of Pernik committed data from detailed energy efficiency energy savings once implemented prescribed in audit reports annual energy savings after energy saving measures /ESM/ in kWh/y, the share of savings in %, reduced emissions of carbon dioxide /CO_2/ t, the amount of investment required for the implementation of ESM in BGN and payback period in years - Addendums № 6, 7, 8, 9 and 10 to report.

№	School	Municipal MS or state school StS	Only for schools with existing information				
			Annual energy savings after ESM, kWh/y	Share of savings, %	Reduced CO_2, t	Required investments value, BGN	Payback period,years
1	PRIMARY SCHOOL „Sv. Ivan Rilski “, “Hristo Smirnenski“ High School	MS	591174,00	41,99	216,13	710892,00	13,20
2		MS					
3	IX PRIMARY SCHOOL „Temelko Nenkov“	MS	468810,00	52,43	142,05	274107,00	3,89
4	XI PRIMARY SCHOOL „Elin Pelin“	MS	332762,00	50,67	180,53	143677,00	5,53
5	XIII PRIMARY SCHOOL „Sv. Sv. Kiril i Metodiy“	MS	138116,62	52,97	74,38	146811,00	12,36
6	PRIMARY SCHOOL „Sv. Konstantin Kiril Filosof“	MS	480876,00	59,22	329,84	454761,00	5,57
7	V SECONDARY SCHOOL „Petko Rachov Slaveikov“, High school of Economics	MS	450404,00	40,57	183,25	316910,00	4,63
8		StS					
9	SECONDARY SCHOOL „Dr Petar Beron“	MS	136860,00	36,54	181,52	488846,00	36,40

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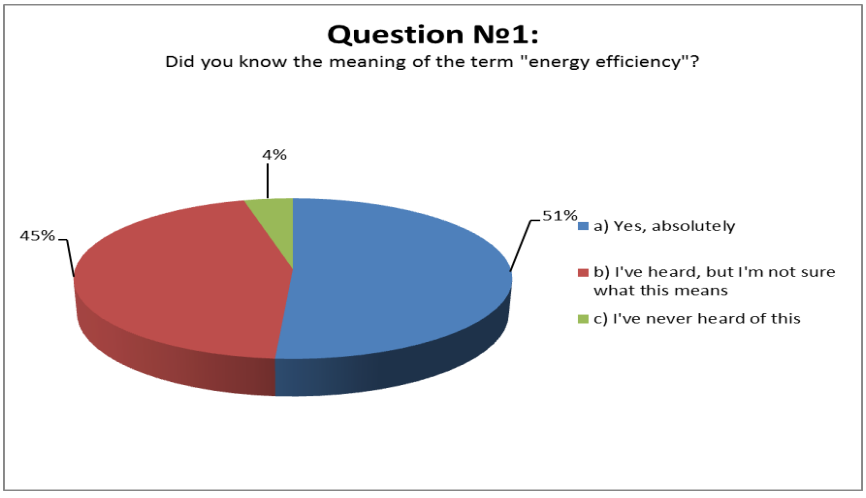
V. ANALYSIS OF RESULTS HELD AFTER ANONYMOUS QUESTIONNAIRE THE STUDENTS IN PRIMARY, SECONDARY AND VOCATIONAL SCHOOLS IN MUNICIPALITY OF PERNIK TO THEIR LEVEL OF KNOWLEDGE ON THE SUBJECT OF ENERGY EFFICIENCY IN SCHOOL AND AT HOME, AND ENVIRONMENT

In this report are presented in graphical form the results of the anonymous survey among 347 students in primary and secondary education in the school 2013/2014g. municipal and state schools in the Municipality of Pernik, conducted by **GRN POWER Bulgaria Ltd.** (**GRN**Power**Bulgaria**®).

The questions included in the questionnaire anonymously survey are developed in partnership with colleagues representing partners in IPA Cross-Border Programee, Serbia – Mechanical Engineering Faculty of the University of Nis.

The purpose of this study is to obtain the knowledge and opinions of students of Pernik Municipality in the field of energy efficiency and environmental protection. The results of this study will be published in two brochures, one aimed at students and the second for adults - their teachers, parents, neighbors, friends, representatives of local government and the Ministry of Education and science to undertake activities on reasonable energy consumption. This increases the interest and motivation for children to contribute to environmental protection.

Main objective of the project, through the provision to hold in the fall of 2014 seminars among students in municipal and state schools in Pernik, is - the children of Europe to learn about the problems of global warming and the efficient use of energy, with the judicious use of finite energy sources, with different options for energy production from renewable energy sources /RES/ to understand their role and contribution to the preservation of our environment and thereby creating a sustainable future for the planet.



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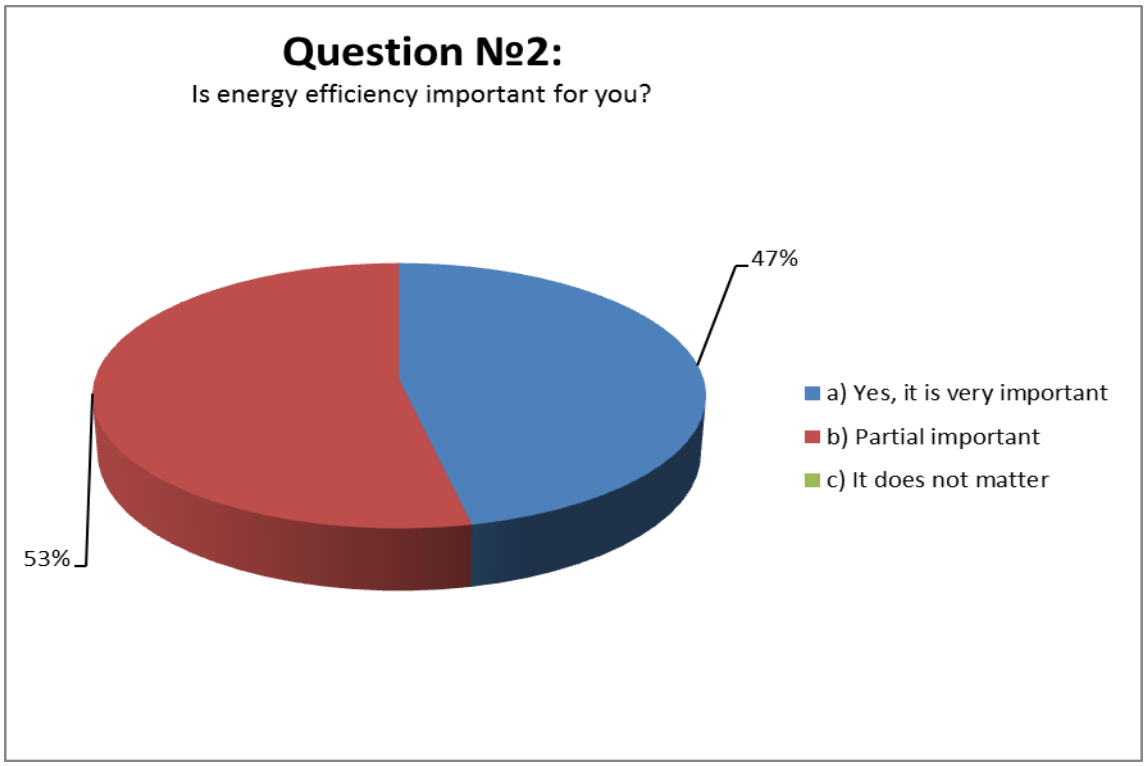

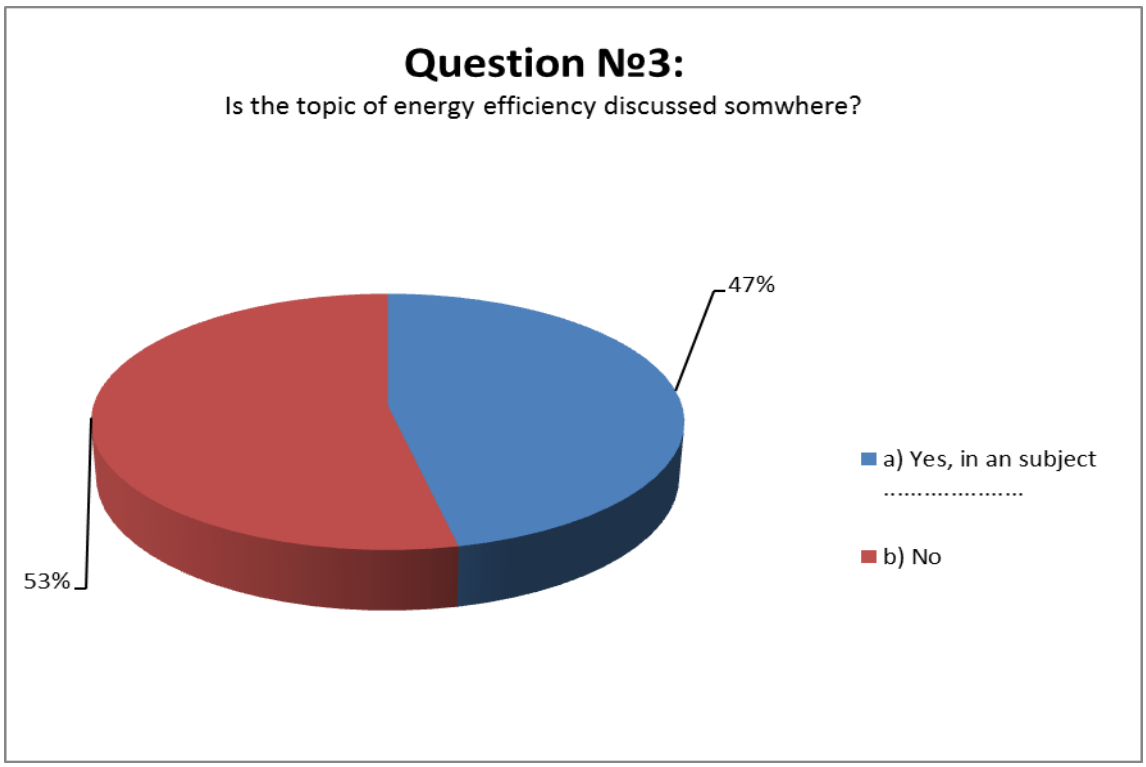

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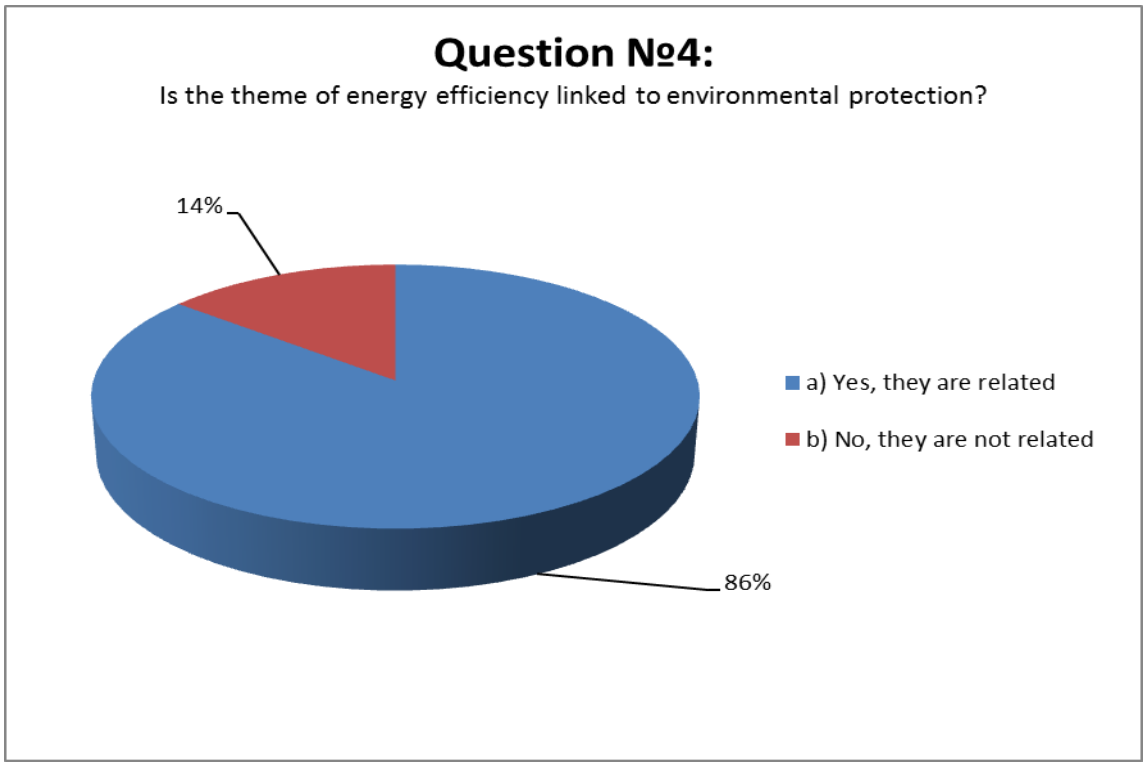

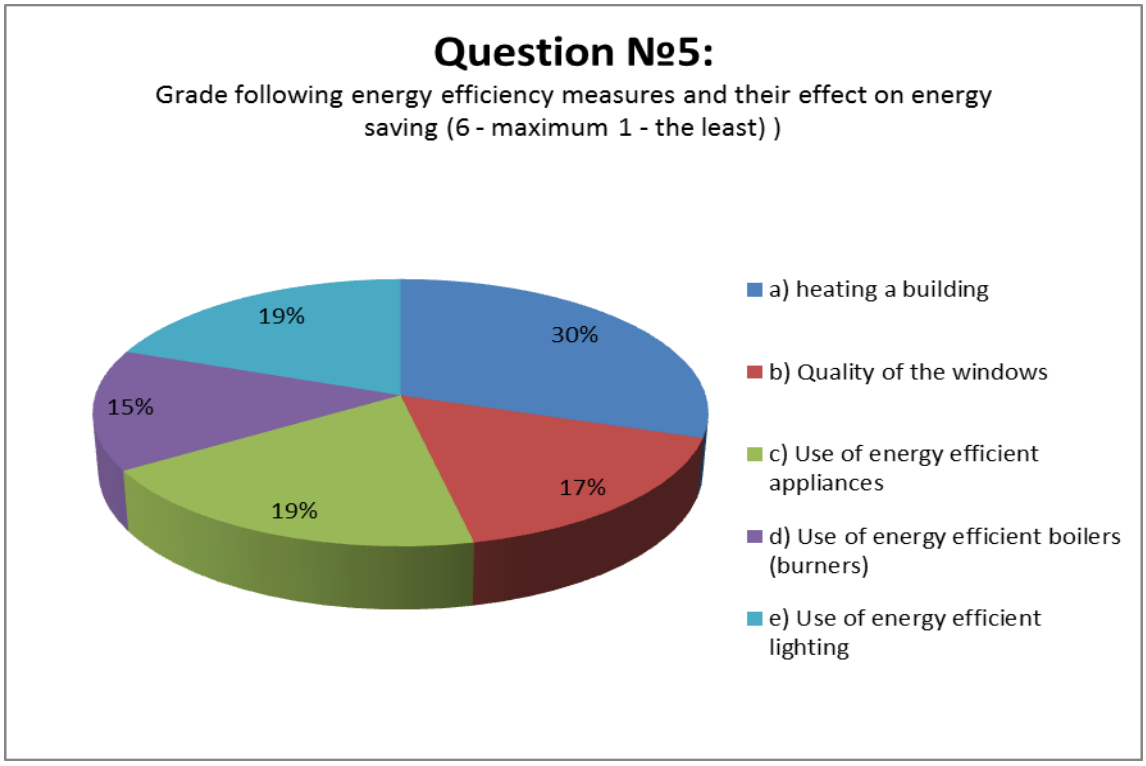

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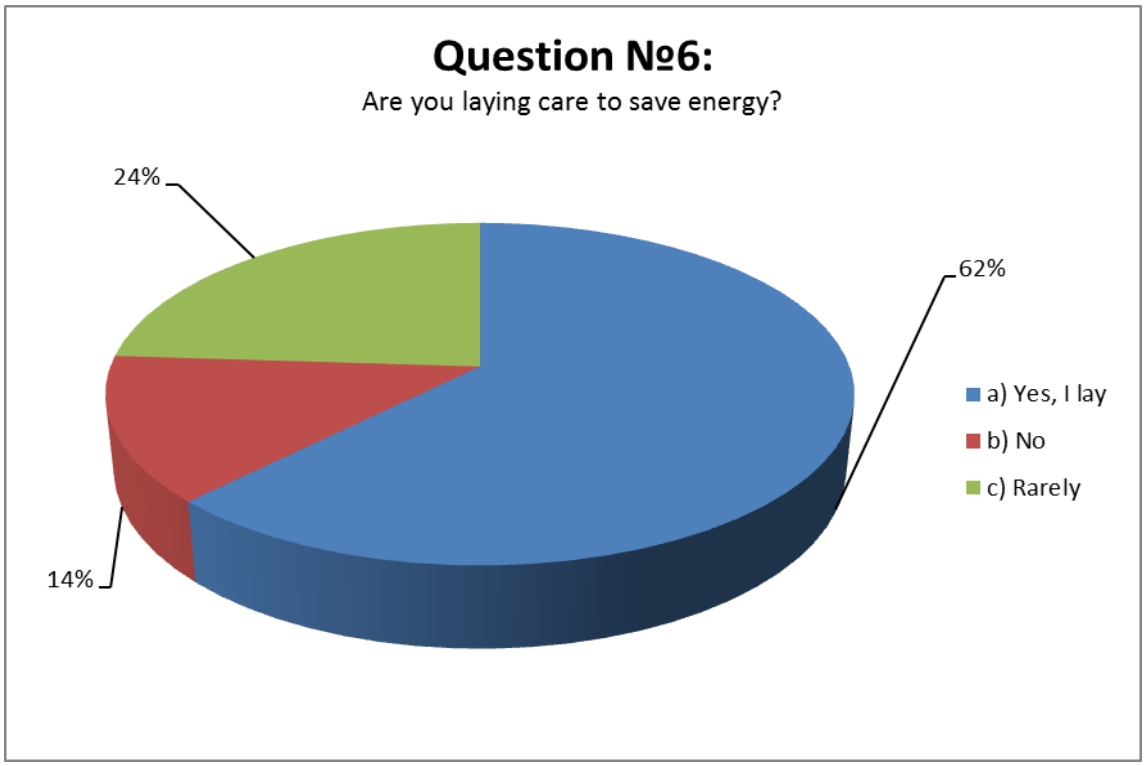

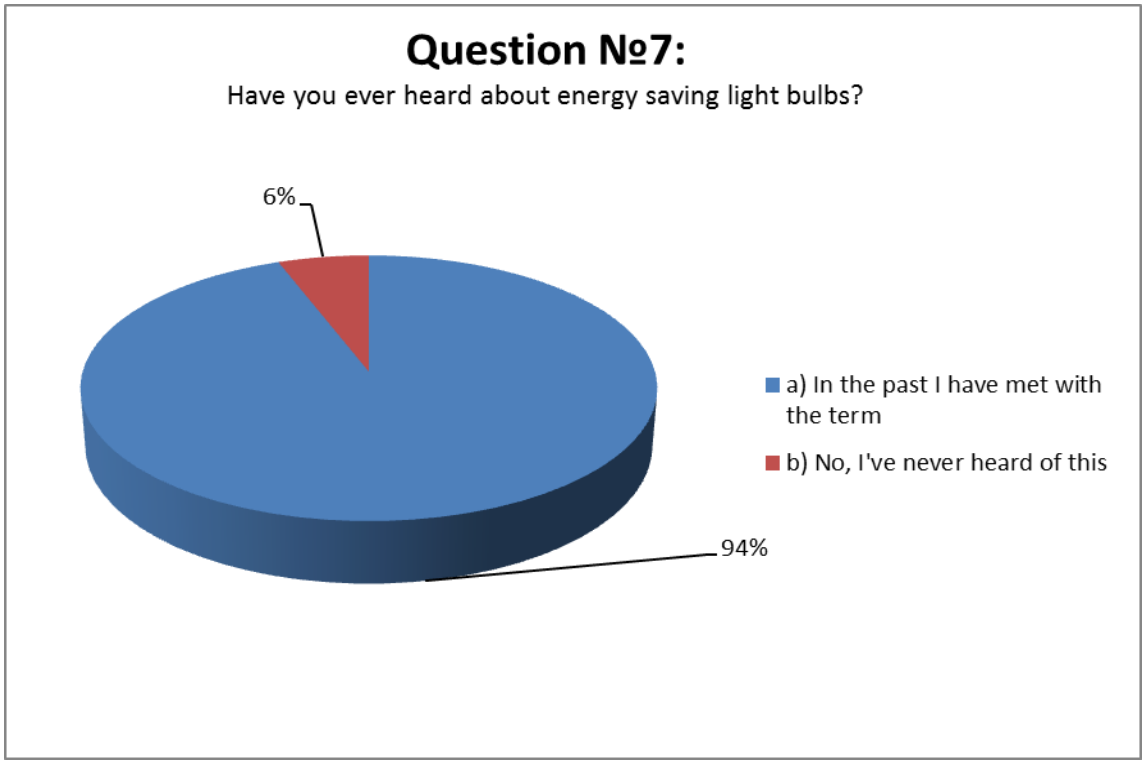

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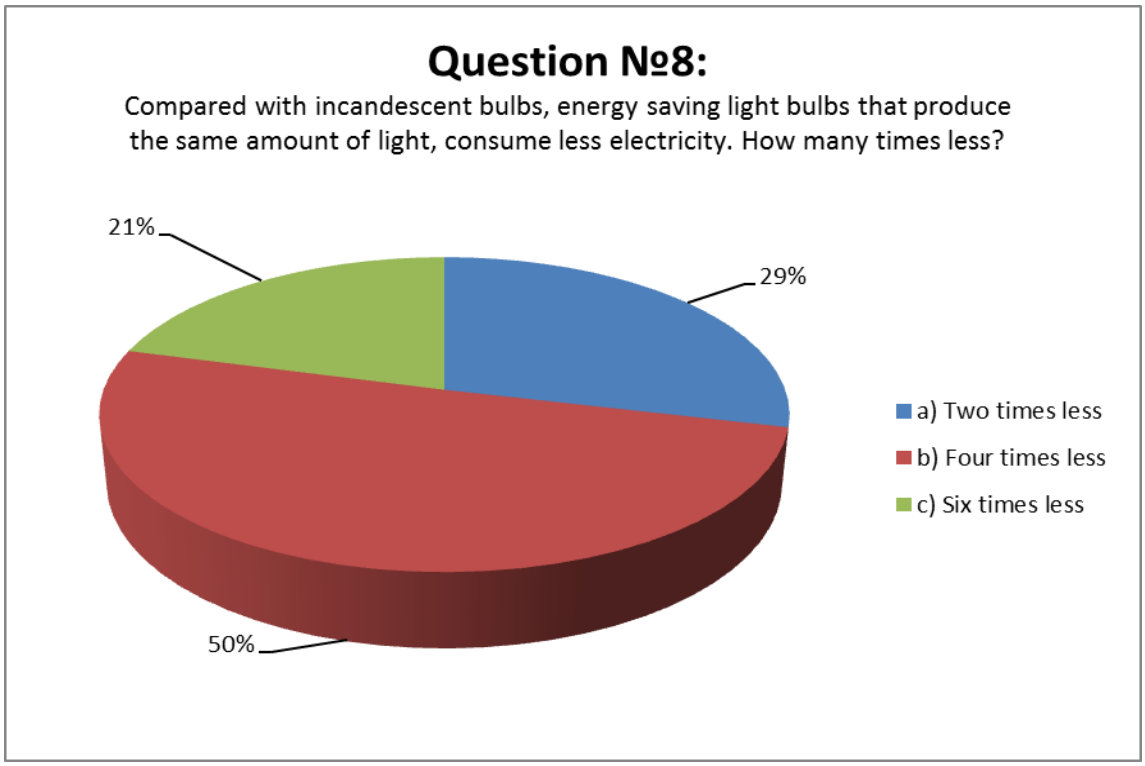

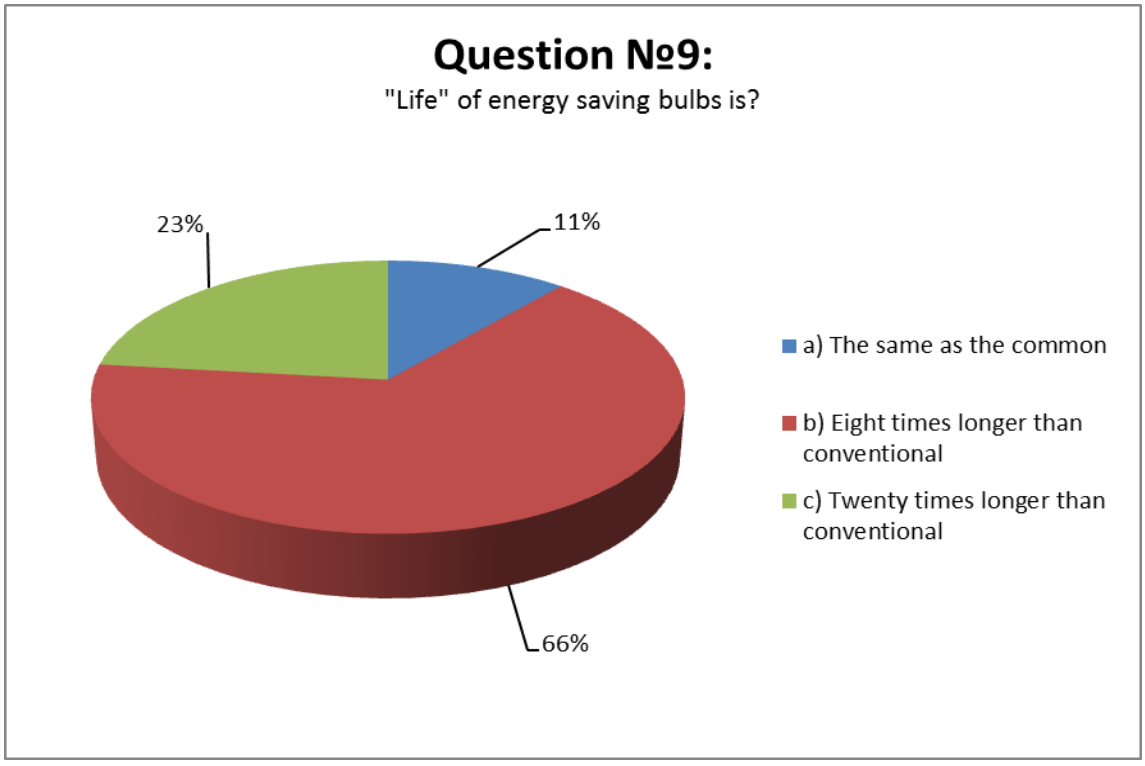

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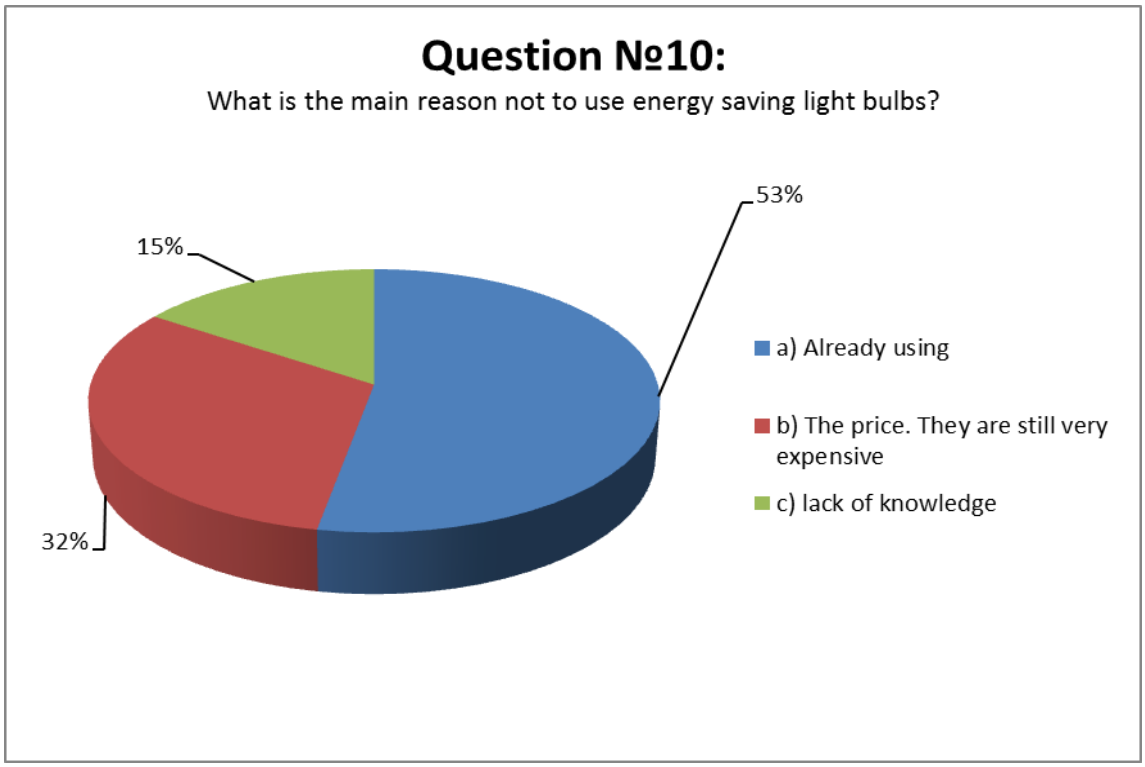

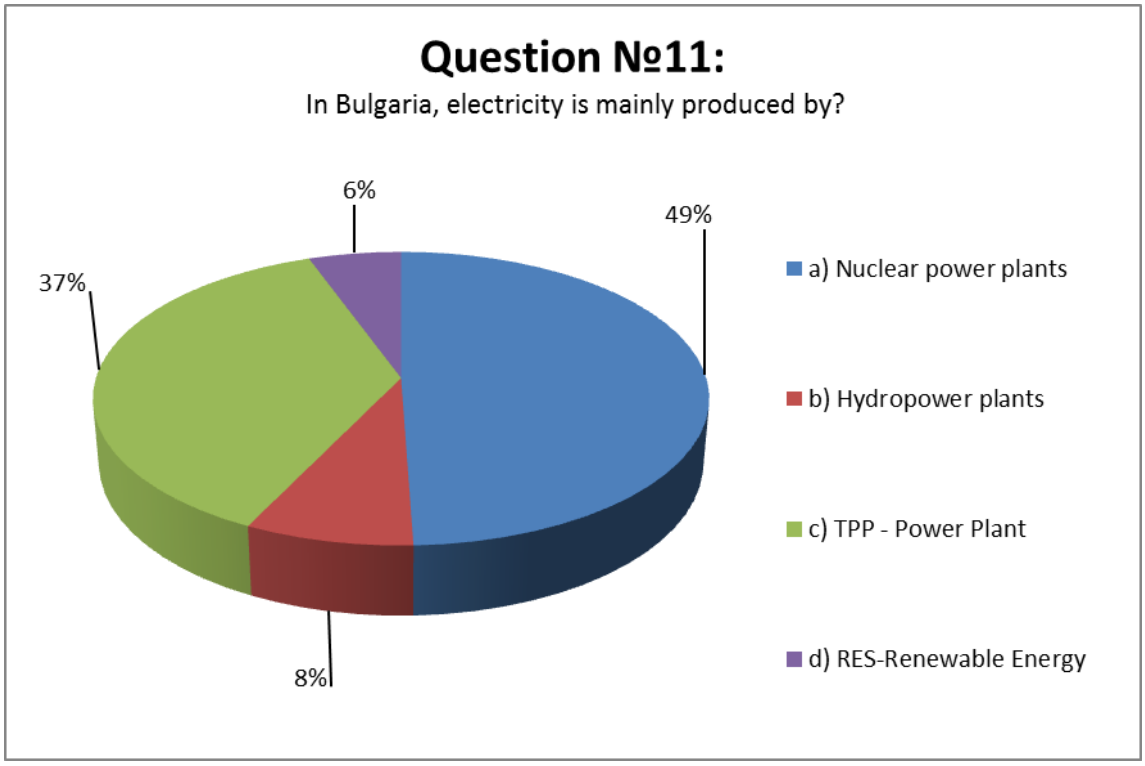

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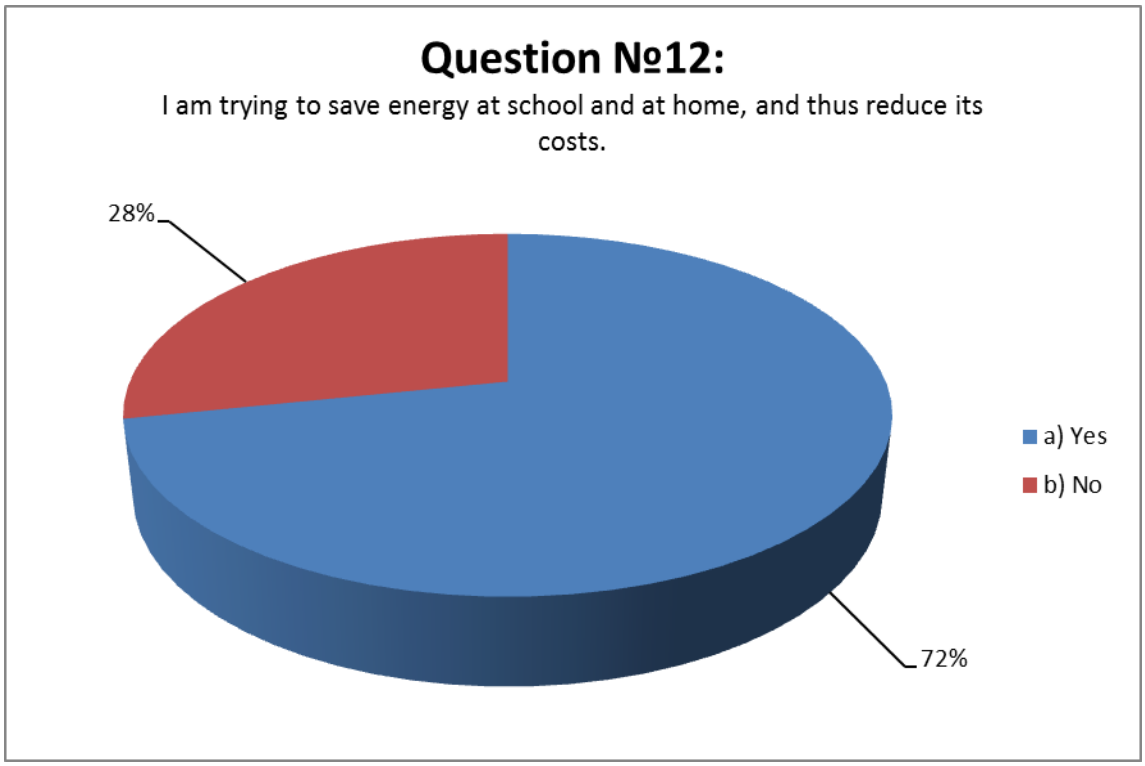

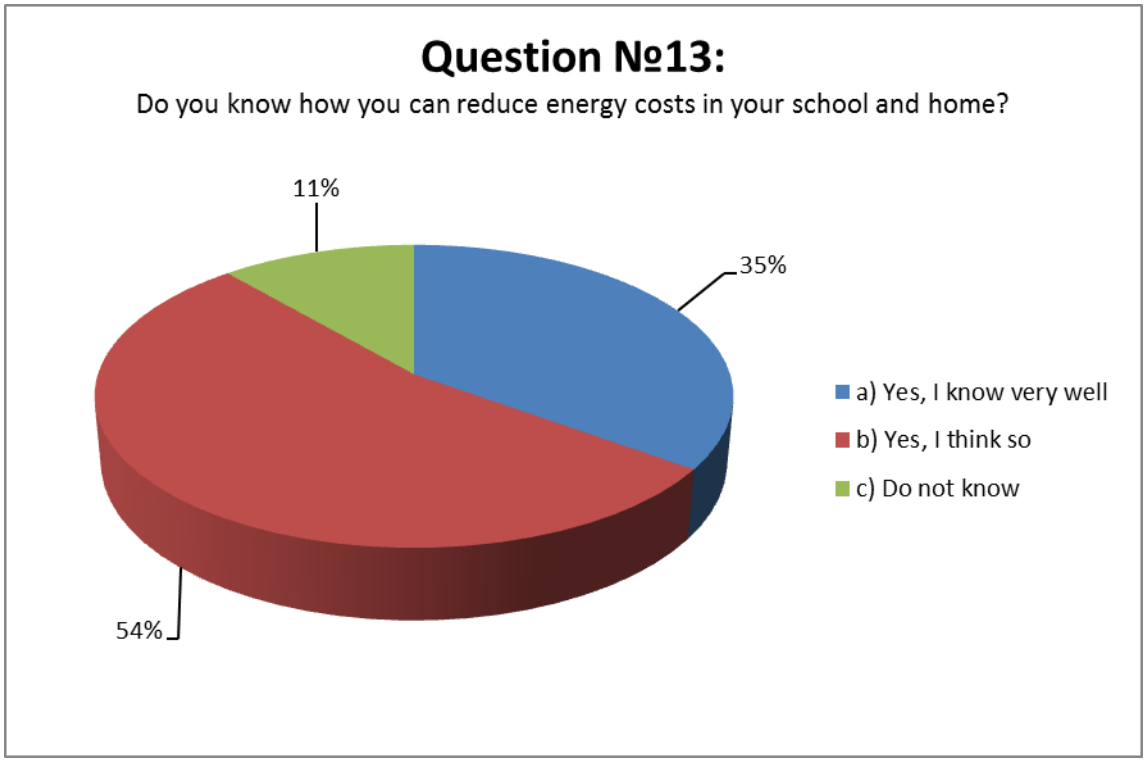

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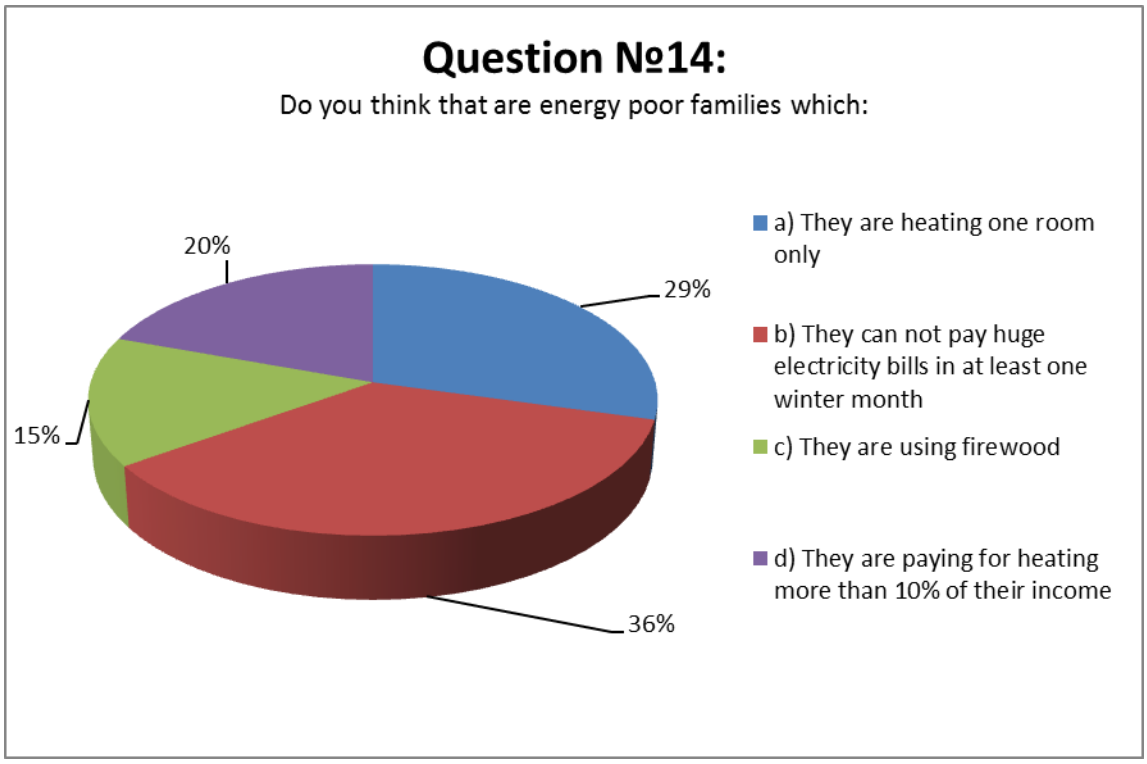

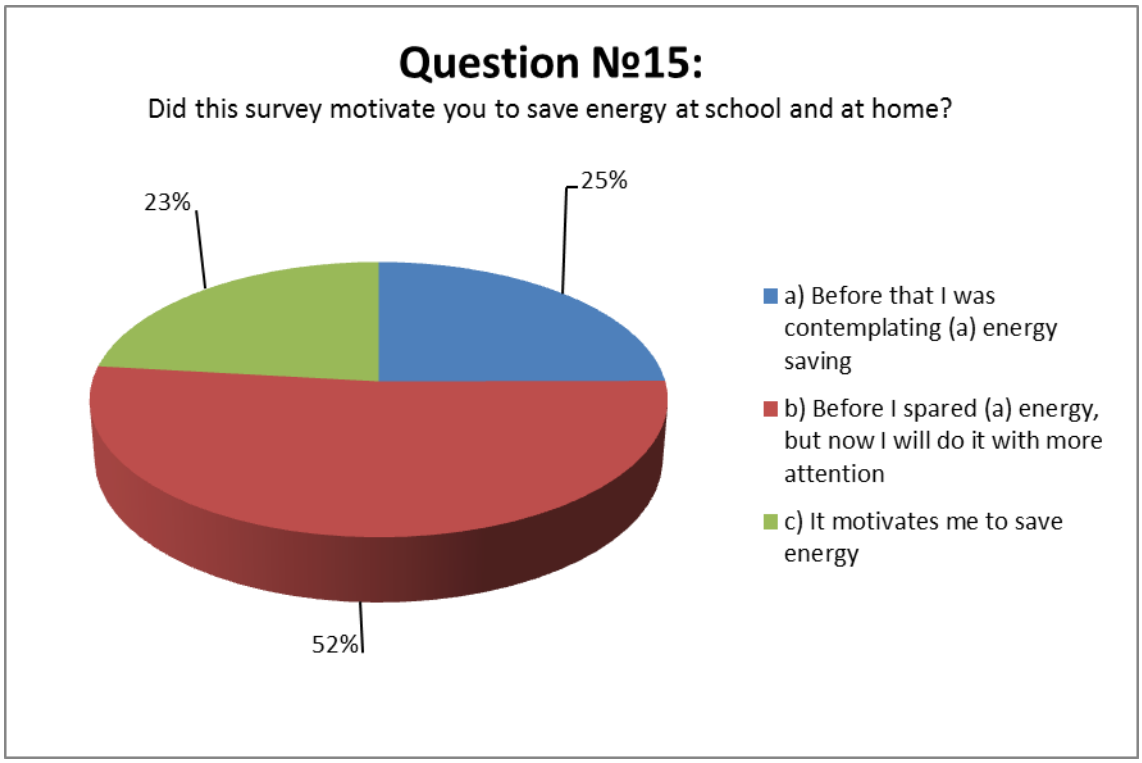

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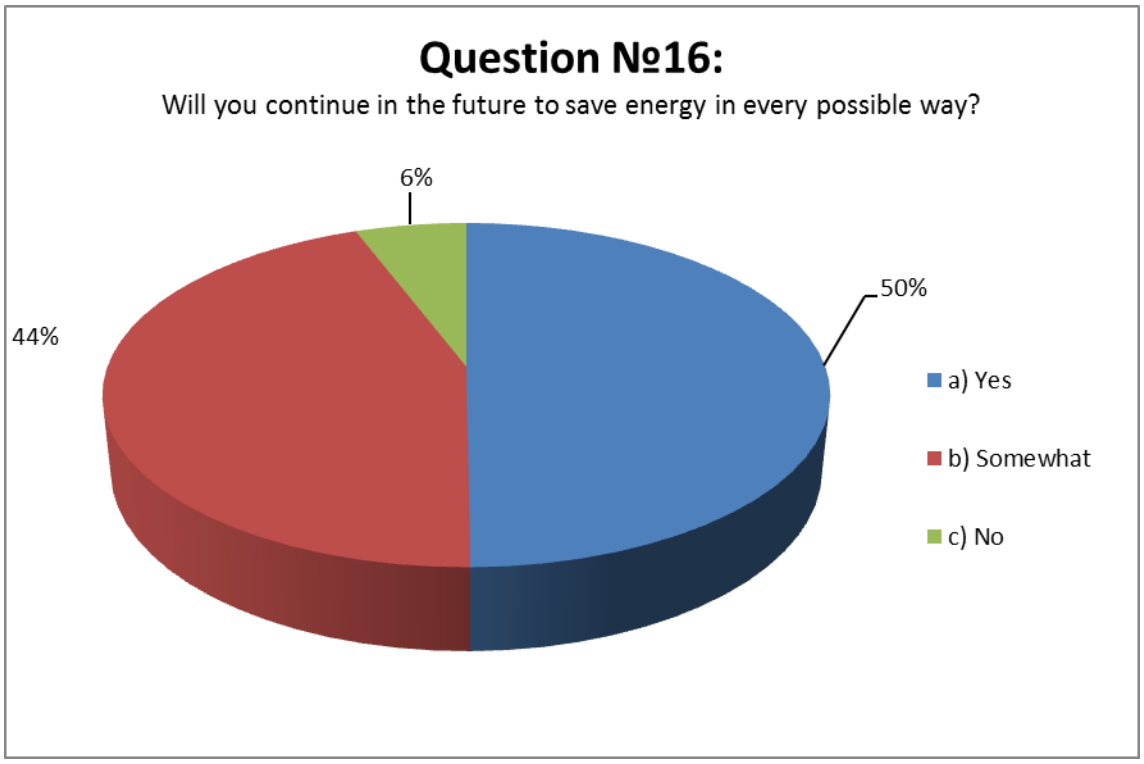

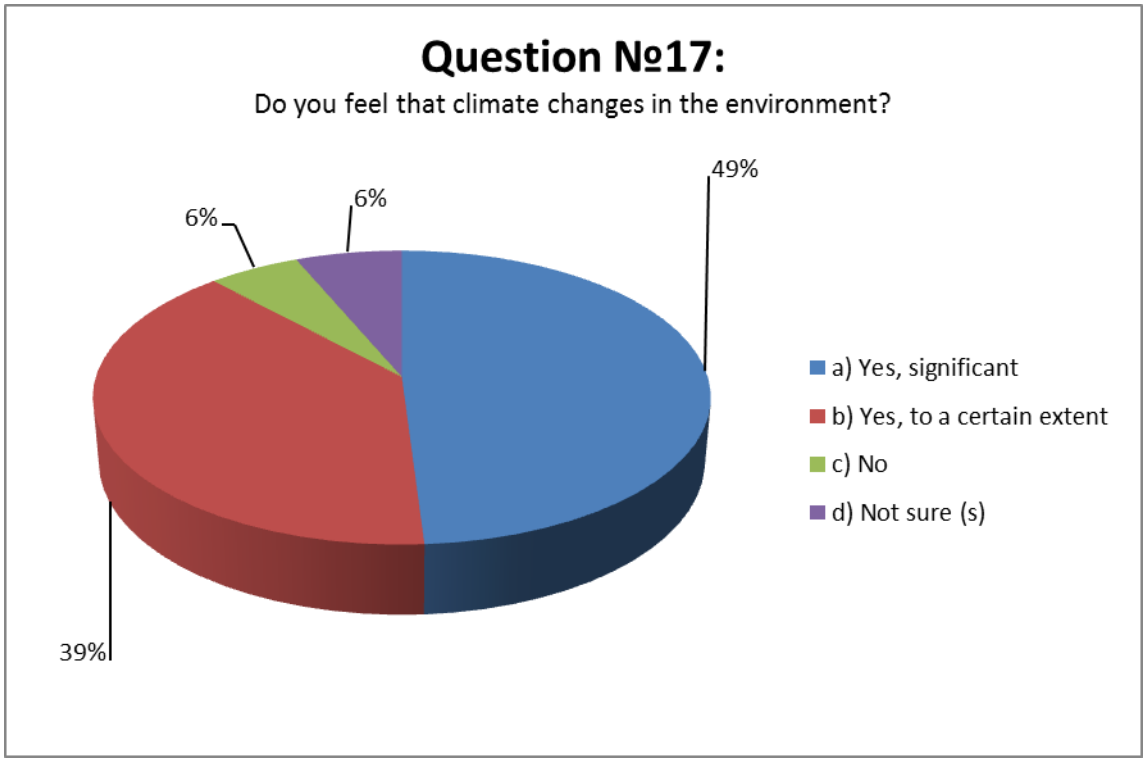

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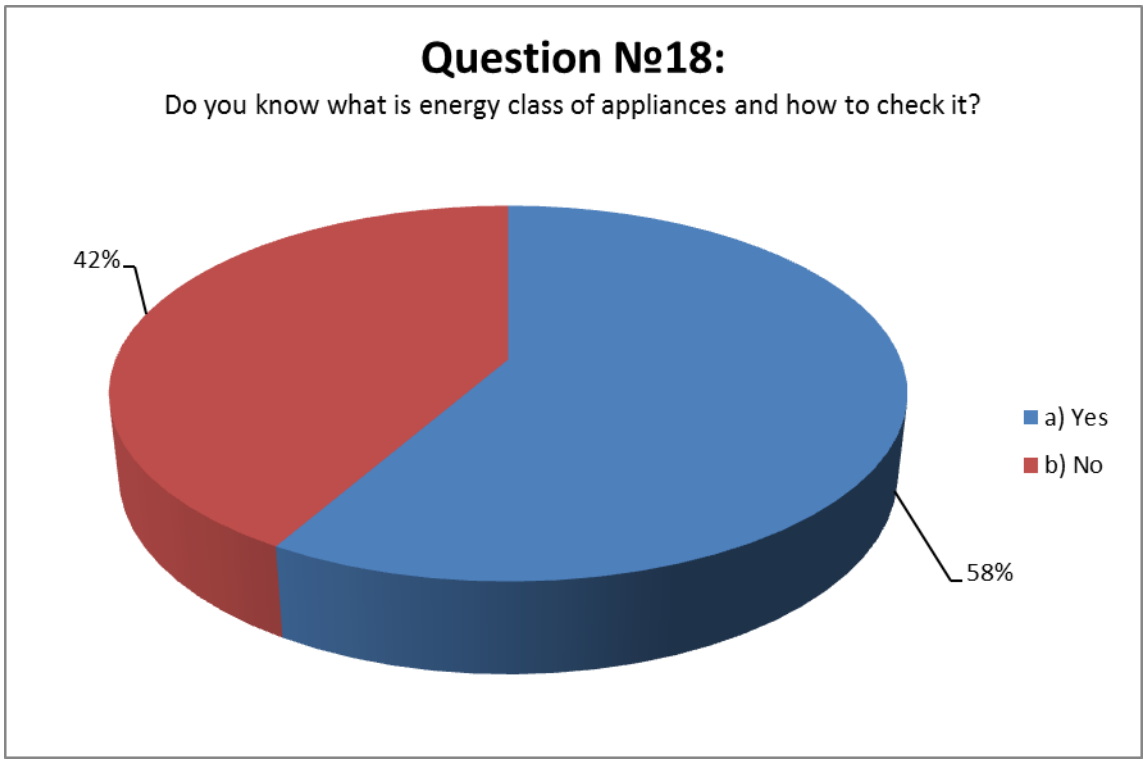

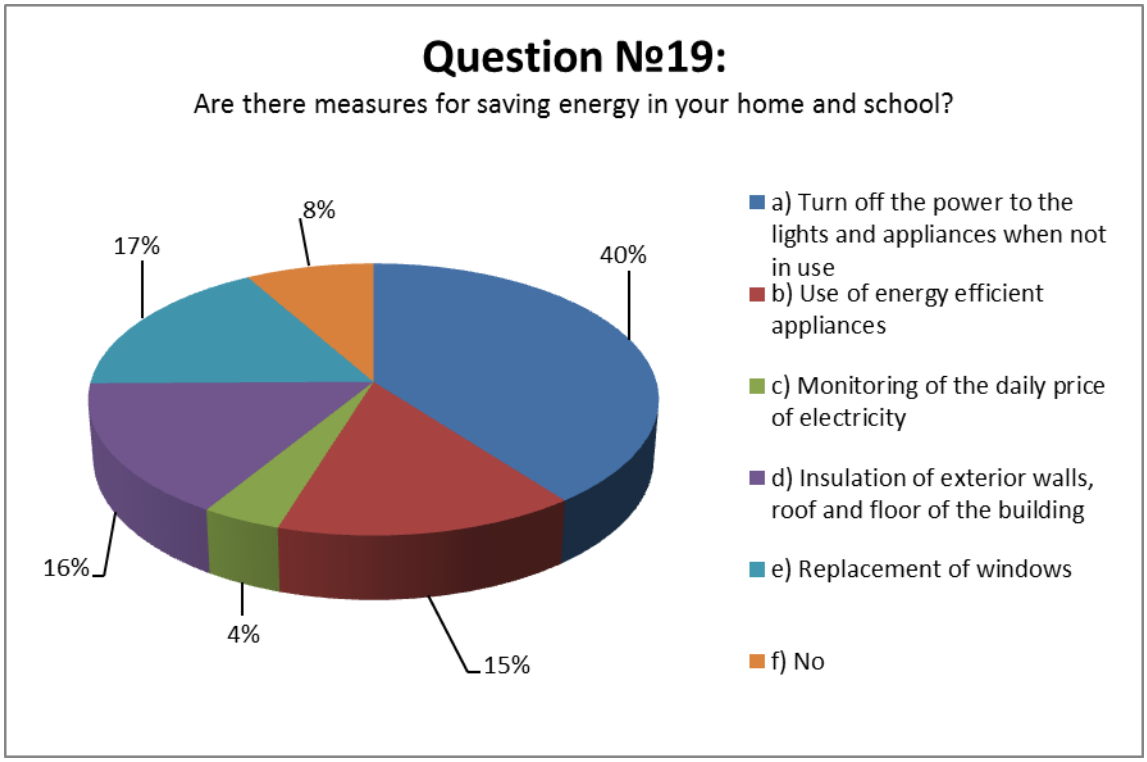

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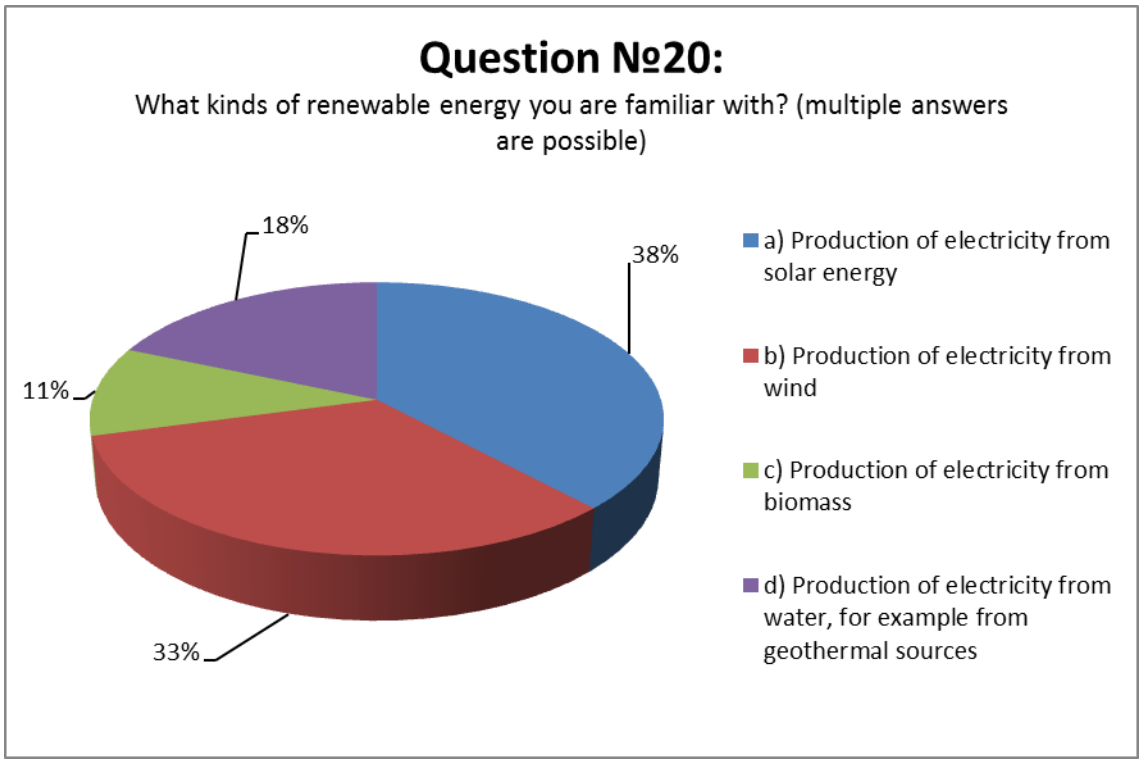

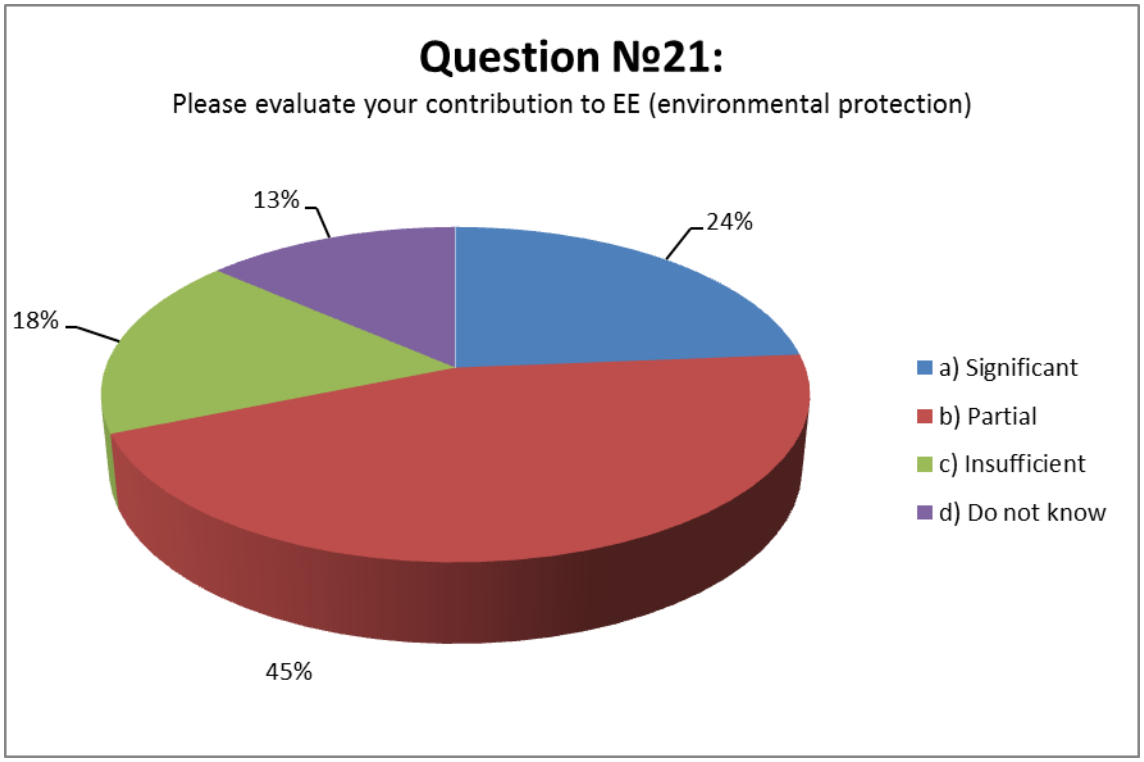

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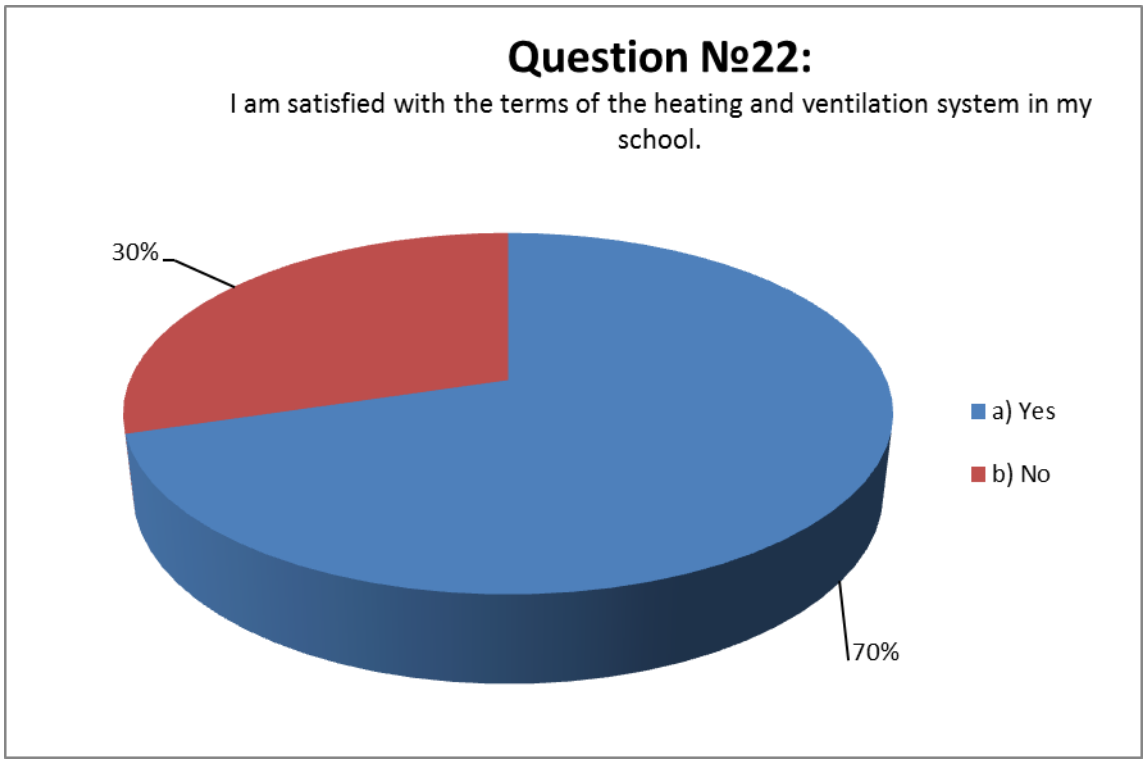

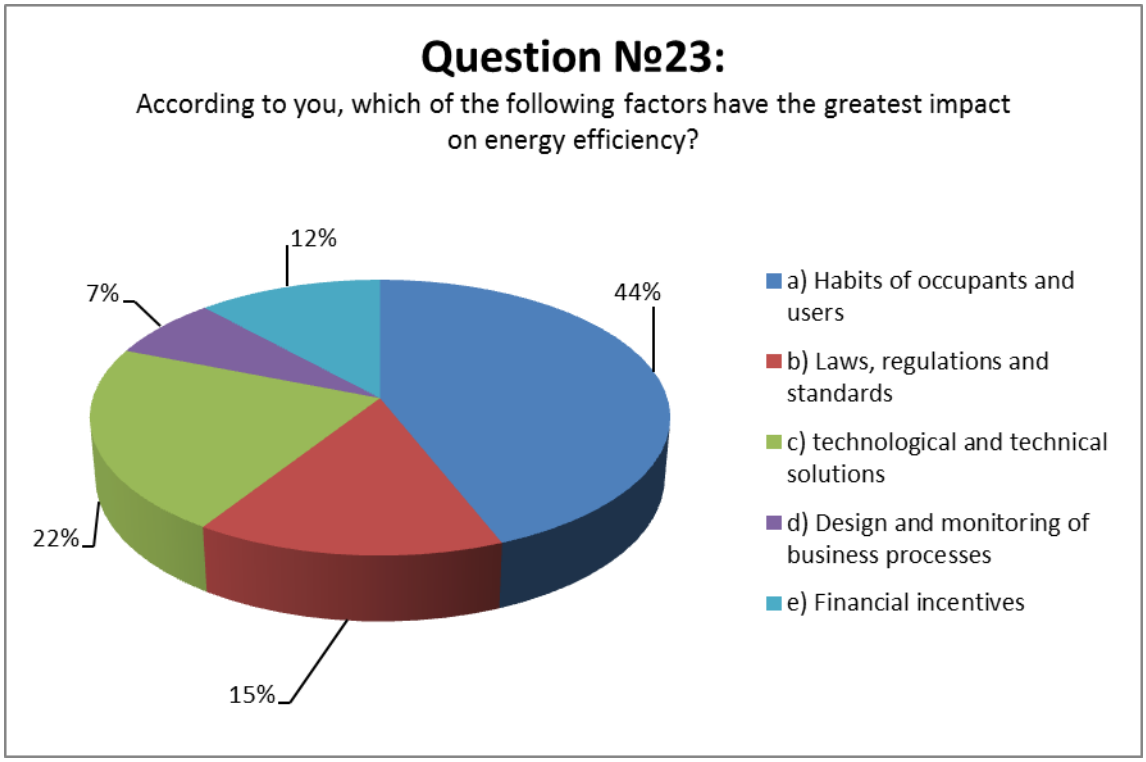

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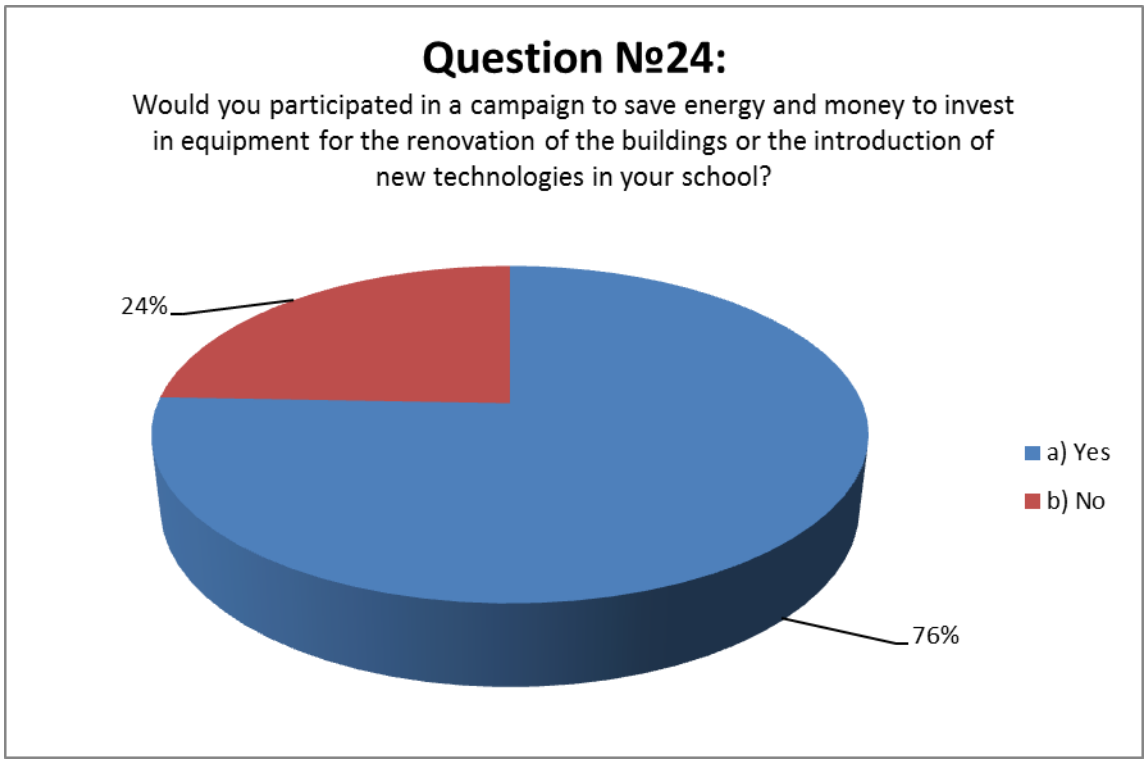

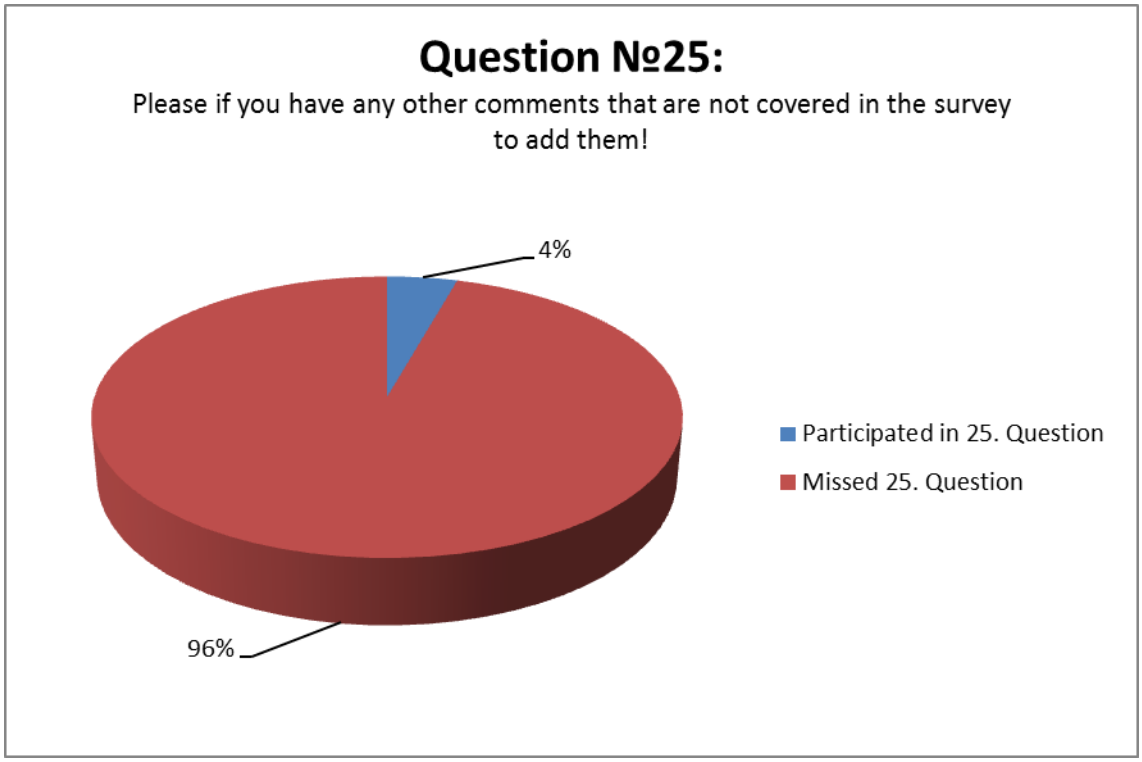

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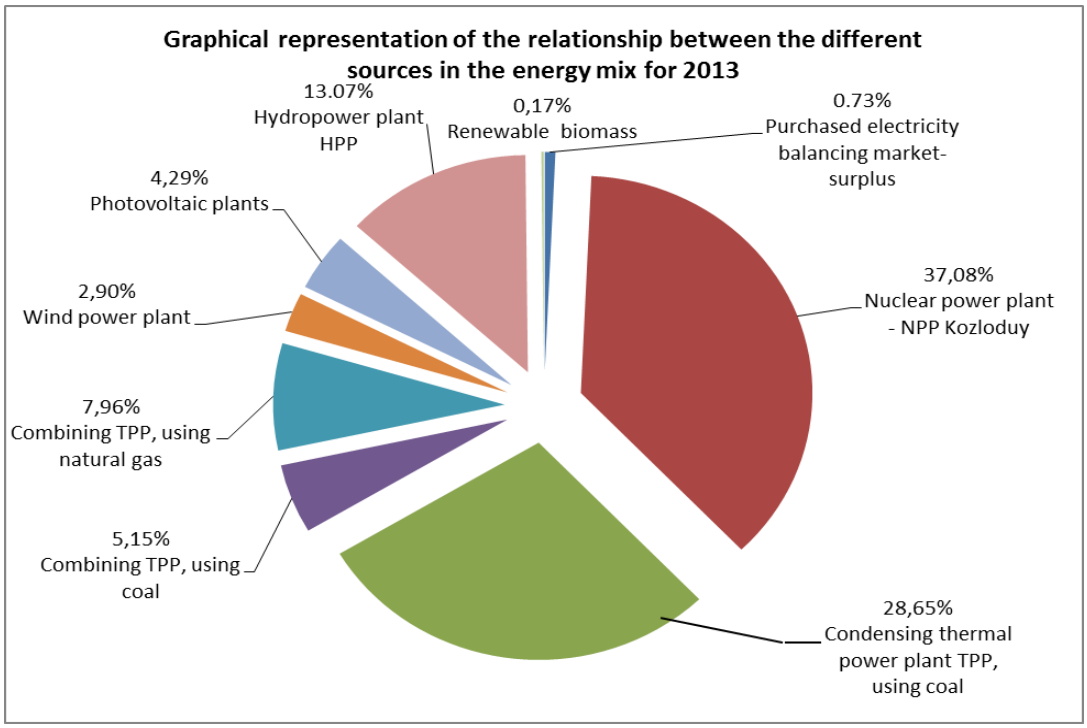
In support of the answers that the students of primary and secondary education in the school year 2013/2014 municipal and state schools in the Municipality of Pernik, took part in an anonymous survey conducted in connection with the question №11: "In Bulgaria, electricity is obtained from the Nuclear power plant /NPP/, Hydropower plant /HPP/, Thermal power plants /TPP/, Renewable energy sources /RES/?" presenting a graphical representation of the relative share of each energy source to the total amount of electricity sold by the public supplier "National Electricity Company" EAD "CEZ Electro Bulgaria" AD to 2013, according to data provided by the "CEZ Electro Bulgaria" AD:



VI. ENERGY SAVING MEASURES

When providing detailed audit and certification of building for energy efficiency, according to the current Legal framework in the Republic of Bulgaria and when the annual energy consumption for heating the building while maintaining the normative values of the temperature is lower than for the reference year which has been designed to fit to, then is necessary to implant energy saving measures.

When the actual coefficient of the surrounding structures and components - surrounding walls, windows, floor, roof is higher than the reference values updated norms at the time conducting detailed energy efficiency is a prerequisite for the adopted energy saving measures proposed in the report energy auditor conducting the study and investigation of the energy efficiency of the building. The purpose of the introduction of energy

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saving measures is that they lead to a reduction of energy consumption and improve the microclimate, ie increase the comfort of living of Investigation building.

Potential measures to reduce energy consumption are typified by the Agency for Sustainable Energy Development at the Ministry of Economy of the Republic of Bulgaria in support of tighter energy auditors as follows:

TIPIFIED MEASURES FOR ENERGY EFFICIENCY

№	Type energy saiving measure	Note
1	External wall insulation	Additional insulation of exterior walls, seal joints in facades .
2	Insulation of floor	Further isolation of the floor.
3	Insulation of the roof	Additional insulation of the roof.
4	Replacement of windows	Replacement of windows, sealing to reduce infiltration losses.
5	Measures on lighting installation	Installation of energy - efficient lighting system control for constant intensity lighting, installation of automatic control. Luminaires with starter systems: lighting with efficient devices. Effective outdoor lighting of public spaces.
6	Measures in the substation	Reconstruction (replacement) of the substation or its components, including insulation .
7	Measures in the boiler room	Reconstruction (replacement) of the boiler plant , or parts thereof (boilers, pumps, piping, valves, etc.). Including settings and insulation. Heat pumps: air-to- air, exhaust air, water, earth resources
8	Measures for appliances for measuring, monitoring and control	Introduction (replacement) of equipment for measuring, control and BMS.
9	Settings (including “lower temperature”)	Setting up systems for heating, hot water, ventilation, heat recovery systems and circulation of thermostatic valves saving hot water: valves with limited flows and others.
10	Measures on the installations	Reconstruction (replacement) of building systems or parts thereof (heaters, pumps, fans, piping, valves, etc.). Including insulation.
11	Renewable energy	Introduction of systems using a following RES: sun, wind, water, earth, incl. pumps .
12	Others	Efficient cooling appliances: refrigerators and freezers for household with high energy efficiency. Effective wet appliances: Dishwashers, washing machines and dryers spinning bits with high energy efficiency. Consumer electronic goods: electronic household products - TV, DVD, computers, etc. Energy-efficient office equipment: computers, printers, faxes, copiers and more. Operating and maintenance personnel training, organizational activities.

Compliance audits of building energy efficiency requirements is met when the value of the energy performance of the building is less than or equal to the reference value.

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Purpose of the follow-up study on the energy model of the building in the course of detailed energy efficiency is the introduction of energy saving measures /ESM/, which will reduce the specific annual energy consumption to or slightly below the normative.

Analysis of the results provide energy auditors performed by comparing the actual parameters reflecting the condition of buildings audited and legal values of the same parameters points to identify potential measures to reduce energy costs.

As a result of analysis of energy developing major groups of measures to reduce energy consumption:

- Improvement of the thermophysical characteristics of the building envelope;
- Reduce consumption of electricity from the lighting system or appliances;
- Reduction of losses in heating / cooling;
- Analysis of the potential to use renewable energy renewables.

Under the Renewable Energy promulgated. SG 035/03.05.2011g. Amend. and additions. SG 029/10.04.2012g . statutory requirement is introduced to assess the possibilities of using renewable energy as follows:

Art. 20. (1) The construction of new or reconstruction, major renovation or refurbishing existing buildings are being commissioned installations for the production of energy from renewable sources where this is technically feasible and economically viable.

Pursuant to the amendment of the Energy Efficiency Act (ZIDZEE) Prom. SG. No 24 of 12 March 2013 statutory requirement is introduced to assess the technical, environmental and economic feasibility of alternative systems for high use of energy from renewable sources as follows:

Article 15. (2) Investment projects for new buildings under par. 1 must comply with the technical , environmental and economic feasibility of alternative systems for highly efficient use of :

1. Decentralized systems of production and consumption of energy from renewable sources;
2. Plants for cogeneration of electricity and heat;
3. Installations for central or local heating and cooling, as well as those that are fully or partially on renewable energy;
4. Pumps.

Art. 20a. (1) Measures to increase energy efficiency are recommended for each reconstruction, major renovation, major repairs of buildings or parts of buildings in operation are evaluated in terms of technical and economic viability of using alternative systems of art . 15, paragraph. 2.

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VII. TAX RELIEF

Tax relief :

According to Article 24 paragraph 1 item 18 of the law, as amended in 2013, tax exemption for buildings can benefit from buildings placed in service before 1 January 2005 and received certificates class energy "B", and buildings placed in service before 1 January 1990 and received certificates class energy "C", issued under the Energy Efficiency Law and the ordinance under Article 25 of the Energy Efficiency Law, as follows:

a) for a period of seven years - from the year following the year of issue of the certificate;

b) for a period of 10 years - from the year following the year of issue of the certificate,

if applicable measures to use renewable energy production for the needs of the building.

According to Article 24 paragraph 1 item 19 of the law, as amended in 2013, tax exemption for buildings can benefit from buildings placed in service after January 1, 1990 and before 1 January 2005 and received certificates class energy "C", and buildings placed in service before 1 January 1990 and received certificates class energy "D", issued under the Energy Efficiency Law and the ordinance under Art . 25 of the Energy Efficiency Law, as follows:

a) for a period of three years - from the year following the year of issue of the certificate;

b) for a period of five years - from the year following the year of issue of the certificate,

if applicable measures to use renewable energy production for the needs of the building.

After one year of operation following the implementation provided in the report made a detailed survey of the building energy efficiency energy saving measures / ESM / including measures to use renewable energy / renewable energy / energy production for the needs of the building is made energy efficiency audit of the reconstructed building, according to Article 24 paragraph 1 item 18 and item 19 of LTFA users or owners of the site can enjoy tax relief for property tax exemption for a period in accordance with the provisions of Article 24 paragraph 1 item 18 and item 19 of the law, from the year following the year of issue of the certificate.

Exemption under par. 1, items 18 and 19 of Article 24 of the Fees Act applies to the total period of the building, not more than 10 years.

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VIII. FINANCING OPPORTUNITIES FOR PROJECTS: LOCAL, NATIONAL AND INTERNATIONAL

NATIONAL TRUST ECOFUND /NTEF/

The National Trust EcoFund was established in October, 1995 through the first Debt-for-Environment Agreement between the Government of the Swiss Confederation and the Government of the Republic of Bulgaria.

According to article 66, paragraph 1 of the Environmental Protection Act the goal of the Fund is managing funds provided under debt-for-nature and debt-for-environment swaps, funds generated from international trade with greenhouse-gas Assigned Amount Units (AAUs) , from sale of aircraft greenhouse-gas emission quotas, as well as funds provided under other types of agreements with international, foreign or Bulgarian sources aimed at environmental protection in the Republic of Bulgaria.

The Fund contributes to the implementation of the Bulgarian Government environmental policies and the enforcement of its international commitments in this field.

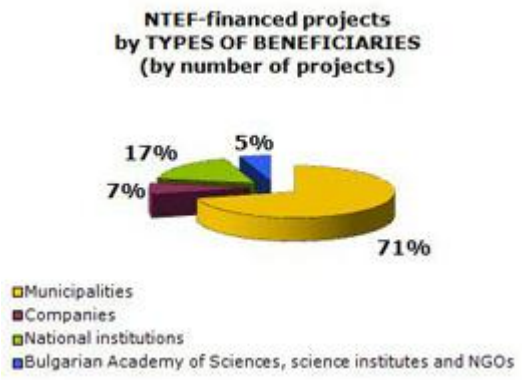
By now the Fund has financed 100 projects at the total amount over 23 million BGN.

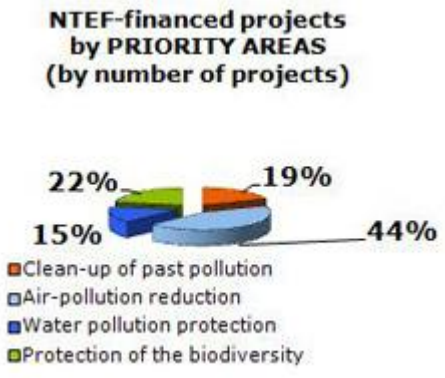
The National Trust EcoFund is an independent institution supported by the Government of Bulgaria.

The National Trust EcoFund is a greatly respected public institution which, in repeated international evaluations and audits, has always achieved the highest results. The Fund's Annual Financial Reports have always been unconditionally approved by the independent auditors.

The NTEF funds projects in four priority areas:

- Clean up of past pollution;
- Reduction of air pollution;
- Clean water protection;
- Protection of biodiversity.





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ENERGY EFFICIENCY AND RENEWABLE SOURCES FUND /EERSF/

Energy Efficiency and Renewable Sources Fund was established pursuant to the Energy Efficiency Act, with intergovernmental agreements between the Global Environment Facility (through the World Bank), the Government of Austria and the Government of Bulgaria. The fund operates according to the provisions of the Energy Efficiency Act, the Energy from Renewable Sources Act and the agreements with the Donors, and is not part of the consolidated state budget.

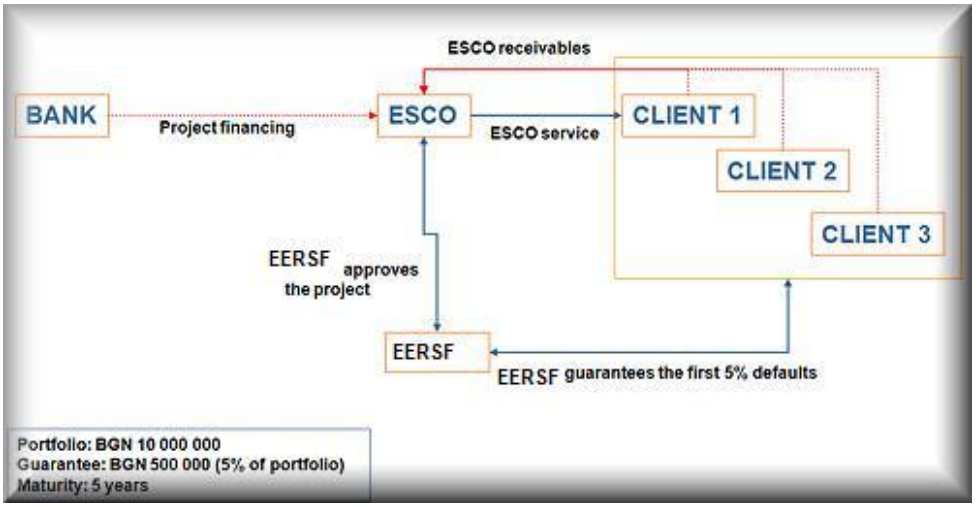
Energy Efficiency and Renewable Sources Fund is the only institution in Bulgaria for financing energy efficiency investment projects.

Portfolio Guarantees

1) ESCO portfolio guarantee - to attract more ESCO companies into this business and to make ESCOs more comfortable by guaranteeing the risk of their counterparties - the project beneficiaries.

2) Residential portfolio guarantee - to kick-start the market of EE investments in the residential sector, by providing market products that overcome the lack of legislation in the country.

ESCO Portfolio Guarantees



Normally **ESCOs** would bid for a project and then go to a bank to secure finance for it, or have a line of financing ready and fill it in with projects. The shortcoming of this approach is that typical ESCOs rely heavily on raising debt to fund their performance contracts. This requires that the cash flow of their business is very accurately timed and budgeted. Delayed payments from clients, or defaulting clients may severely disrupt the servicing of the debts of the ESCO itself. With our ESCO portfolio guarantee, we **undertake some of the risk of the ESCO** and guarantee that we will cover such disruptions in the flow of receivables of the ESCO. In practice this means the following:

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- EERSF signs a framework agreement with the ESCO to issue a portfolio guarantee for a preapproved portfolio of projects;

- The ESCO wins a tender for an energy efficiency project;

- EERSF approves the project and adds it to the portfolio of approved projects;

- EERSF guarantees that it will **cover up to 5%** (the percentage is negotiable) of the defaults of the delayed payments of this portfolio;

- With this guarantee, the ESCO gets better interest rates on its debt with commercial banks and has a piece of mind that there is **5% failsafe trigger**that will prevent cash flow disruptions and will reduce the risk of the clients.

Statistically, the default rate of clients of ESCOs is negligible so that 5% cover of the guarantee is more than sufficient. Delays in payments are more probable and in such cases EERSF will act as a **financial buffer** to take the shocks.

On the other hand, such product provides an **excellent leverage of EERSF's own funds**. For example a BGN 500 000 guarantee will facilitate a portfolio of investments in the amount of BGN 10 million.

IX. CONCLUSION

Main objective of the project is Europe's children to get acquainted with the problems of global warming and the efficient use of energy, with the judicious use of finite energy sources, with different options for energy production from renewable energy sources / RES / to understand their role and contribution to the protection of our environment and thereby creating a sustainable future for the planet.

Creation of a favorable and stable environment for raising, training and education of children and students are the main priority of Pernik Municipality.

Despite the difficulties in the financial crisis, Pernik Municipality takes great care and effort and work for:

• construction of a modern material - technical basis in schools;

• Access to each child and student to quality information - communication technologies;

• new playgrounds ;

• equal access to quality education;

• linking the disciplines and professions with the labor market and economic development;

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• knowledge / awareness of children regarding environmental, energy and economic benefits of implementing energy efficiency measures in buildings of schools - ie their attitude towards rational use of energy , the environment and their contribution to the welfare of the region - Pernik Municipality.

Currently in Pernik , according to the Ministry of Education operate 22 public schools, six public vocational schools, a state special subsidiary school / children with mental retardation / and a public service unit - a group of resource support. The number of students according to data from the official website of Pernik Municipality for the academic year 2010 - 2011 municipal schools is 6865, divided into 334 classes, and in vocational schools is 2209 .

This distribution of the school system in Pernik municipality currently meet the needs and requirements of children and students for education.

Professional schools of the Municipality of Pernik to professions that offer provide young people's needs for education and implementation and are associated primarily with the development of the local economy. These are architecture and construction; interior design and interior; computer-aided design; ecology; management and finance; Tourism and Hospitality.

In the training of students can use different forms - conducting traditional lessons, lectures, discussions, research, organization of joint events with other classes or schools.

Training for energy efficiency in school will show the students the basic principles of energy efficiency and will allow for saving energy in their everyday lives.

Younger students (up to 9 - 10 years) still cannot understand the physical sense of energy. Therefore, the issues related to energy and energy efficiency should be considered in practical terms with younger students, the position of the child and the world around him. Most attractive and effective form of training for this age is the game. Happy children compose and discuss stories about energy. Effective exercises are those where children can do something with their hands: to color of drawing books related to energy, to make applications to assemble different models.

Older students (10-14 years) with interest perform tasks that allow them to increase their status in the class and school: by working in the school patrol, monitor water consumption on and off the lights. In their ability to explore energy use and saving of resources and energy in their school, home, and explore heat loss in buildings. This work is interesting for children prone to communication and active practical work. Students of this age also gladly deal with different art on the theme of the project - draw, make models, compose stories, participate in contests.

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In working with high school students (14-19 years) the best results are achieved when the tasks coincide with their plans to further their education, or public activity. Older students tend to research, can fully exercise the research work related to energy and energy efficiency, through their tasks explore certain methods and discuss the results. Such work can be published, the author can participate in conferences or seminars, including the university, which wants to apply. High school students can try in collaboration with journalistic and publishing e looking for a platform for dissemination of their findings. Particularly interesting for older students are playing with the participation of experts in the field of energy, energy efficiency and energy saving, which play the role of government officials, academia, business, the press, public organizations. Through interaction with older players, the students look and try to implement their ideas for improving energy efficiency and environmental protection in their area.

For students from secondary and postsecondary education are interesting the tour routes in environmental pathways explaining the relationship between energy, energy saving and environmental protection, excursions to energy companies, the study of the sources of supply of electricity and heat in their city and region.

Besides theoretical problems students can actively participate in practical work, to show initiative , make your choice and make decisions .

Practical activities must be oriented towards solving the current daily issues. Children actually need to see the link between theory and life. Training is needed to stimulate their imagination and allows for independent thinking.

Namely practical activities best and most effectively organize and rally the students. Practical problems associated with energy savings could be :

1. Monitoring and measuring energy consumption at school and at home.
2 . Compilation of energy passport of the school.
3 . Growing plants for biofuel in school and at home.
4 . Evaluation of energy consumption and an optimum diet according to energy values.
5 . Research based on the results of the excursions to energy facilities.
6 . Identification and study of the causes of energy loss in school, at home.
7 . Use of natural resources in the past, nowadays , forward .
8 . Playing detective (eg , investigating the loss of energy production and transportation of food, or the path of acquisition and transformation of energy that is used to turn on the lamp in the class) .

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The aim is to implement simple energy saving measures at school and at home.

Very important for the confidence of children and expand their activities are disseminating its results both in their school and beyond. This could be done by:

- invite parents to meet and talk about their work , especially that associated with domestic savings, with possible cost -saving on the family budget. This can be done in general PTA meeting of the school;

- Invite other students from neighboring classes from other schools meeting, school seminar or conference and talk about their experiences;

- Hang posters or make an exhibition of drawings at the school;

- Issue its own newspaper, brochures or flyers and distribute them to students and parents in your neighborhood, etc;

- Interact with representatives of local government and politicians, invite them to a meeting at the school where they can share their experiences and to ask questions or send letters to the authorities or flyers;

- Interact with the experts and ask them for the local energy situation;

- Find public organizations working in the field of energy and environment and have the opportunity to understand more about their work, to cooperate;

- Interact with journalists, giving them their themes and outcomes of publications;

- Invited the press to their trips to "hot spots" of energy losses, etc.

Besides students, when talking about energy efficiency must be included and their parents, older relatives, family members, neighbors, and others. To be included in the measurement of energy consumption in the home, discuss the results, looking for a way -saving heating and electricity . Children share with adults the knowledge obtained in school: how to store heat in the house, how to better insulated windows and doors, how to save electricity. When the students feel their importance in the family and the importance of the information they received.

Particular attention should be paid to the role of transport in terms of energy efficiency in schools.

Going to school by bus , driving to the store, visit relatives , travel during the holidays , and any action , which is moving or moving an object from one place to another , require the use of transport, respectively, consume energy . Not only large trucks or ships that supply us with goods , but daily traffic by cars, buses , trains and airplanes also has a major impact on energy consumption and hence the environment. Transport and in particular individual transport is not only consumer of energy, the source of emissions and noise, but also requires space for parking.

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Here students could seek information about how the problem is solved transport in other countries , how could they move so as to save fuel and have less harmful emissions into the atmosphere (public transport, bicycle, inline skates , school buses that can carry more children with a vehicle , etc.) Any ideas students need to be heard, discussed, to encourage those with great practical value. For children it is important to recognize the importance of their work.

Energy efficiency is a very important topic. We need to change people's thinking, and that is extremely challenging. And since the future of the world's children is especially important to understand the problem, ie to start with the smallest. In Bulgarian school children should be trained in energy efficiency now more than ever to raise awareness and knowledge in order to achieve real change in the use of energy. During their studies, students should acquire knowledge that will not only affect their current and future lifestyles, but also to influence the behavior of their families and the elderly in general. The impact on children is the surest way to achieve immediate and lasting changes in their behavior related to attitudes to energy and the environment.

Prepared the report from the study and report detailed analysis of the energy consumption among elementary and secondary schools in the Municipality of Pernik and conducted an anonymous survey after students in primary and secondary schools in the Municipality of Pernik to their level of knowledge on the topic of energy efficiency school and at home, and for environmental protection **team "GRN POWER BULGARIA" Ltd.:**

1. **Dipl. Mag. Eng. Vyara Zlateva** – Manager, Expert Building Structures

2. **Dipl. Mag. Eng. Evgenii Kolev** - Manager team, Expert electrical and automation

Manager:

/ Dipl. Mag. Eng. Vyara Zlateva /
"GRN POWER BULGARIA" Ltd.
Certificate №00309/20.09.2011 in a public register in Sustainable Energy Development Agency /SEDA/
Certificate №00067/12.07.2013 in a public register in Sustainable Energy Development Agency /SEDA/

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