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ENERGY CONSUMPTION IN HOTEL INDUSTRY – CASE STUDY IN OHRID

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Abstract: Renewable energy is necessary for each industry functioning, also for hotel industry. It's necessary for warming, lightening hotels, for kitchens functioning in hotels, for transport vehicles movement, for hotel pools, etc. In lack of classic energy sources, long period of time some work is done on finding new energy sources, besides oil and coal, water and wind.

Nowadays, solar energy is very popular, which is already supplied, bio-energy, wind energy, water energy, geothermal and gas energy, steam, and still a work is done on permanent finding of new renewable energy sources (fuel cell resources, ocean/wave resources).

In this paper, overworked data is shown, brought by Ohrid hotels and *SWOT* analyses has been done of energy consumption in hotel industry in Ohrid, with proposals for modernization, efficiency, aiming to modern tourism development, environment protection, human health protection.

In this way, basic demands for entering the European Union will be satisfied and legislative harmonization in Republic of Macedonia with other *EU* members is going to be realized.

Keywords: renewable energy sources, sun collectors, energy in hotel industry, legislation for renewable energy sources.

INTRODUCTION

Energy means working bodies capability. In mechanic there is classification according to which there are two types of energy: Cinematic (moving energy) and

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potential (static energy). Sum of kinetic and potential energy of an isolated system, with no dissipative forces is constant.

According to type of usage the energy can be: chemical, thermal, electrostatic, magnetic, lightening, atomic. Energy can be transformed from one form to another, but it can be created or destroyed (Law for maintaining energy). Energy is measured in Jul(J).

Energetic is technical-physical-economic science (theoretic and practical), conditions and laws which are in power for different types of energy: finding energy source, producing technology, transformation, distribution, using energy and power in technical, industrial, economy etc.

There are many different ways in which the abundance of energy around us can be stored, converted and amplified for our use. Energy sources will play an important role in the world's future.

The energy sources have been split into three categories:

1. Fossil fuels
2. Renewable energy sources
3. Nuclear sources

The fossil fuels covered here are coal, petroleum and natural gas.

The renewable energy sources are solar, wind, hydroelectric, biomass and geothermal power.

The nuclear-powered sources are fission and fusion.

Table 1.: Characteristics of energy issues

Energy issues	Characteristics
Biomass	Materials such as wood, animal waste, and crops are called biomass. These materials can be burned to generate energy for human consumption
Coal Energy	Many scientists feel that conservation of current energy resources, not the development of new energy sources, will be the method of the future
Energy efficiency	The rise in use of energy resources has led people to try to use energy in a more efficient manner
Energy recovery	One of the problems with current energy usage is that it is highly inefficient and vast quantities of energy are wasted
Geothermal Energy	Geothermal Energy seeks to generate power from the high temperatures below the Earth's surface
Hydroelectric power	Water, like wind, has been used to do work throughout history. Interest in using hydroelectric power was sparked largely by the desire for a new source of energy
Nuclear Fission	Nuclear Fission is being used in nuclear power plants to generate substantial amounts of power. However, there are dangers to using it and it won't be possible to use it forever
Nuclear Fusion	Nuclear Fusion is an alternative energy source of tremendous potential. If properly developed, it could solve all of the world's energy problems
Photovoltaic	The energy of the sun can be acquired through solar energy panels, but Photovoltaic provide another option
Solar Power	Soar Power is an extremely clean and from of energy that comes from the sun
The energy Path to the future	Many people have different views concerning the future of energy usage, and the current path is uncertain
Wind energy	Wind power has been used at least since 600 BC. The energy source has become popular in the search for a clean and renewable energy sources

Renewable source are filling up through physical and chemical cycles.

On the opposite, not renewable sources are not filling by themselves, or with fossil fuels they're doing it slowly.

Renewable sources can be lost because of pollution in living environment.

There are organic and inorganic types of renewable energy sources. Example for renewable organic substances is field and animal type. Inorganic examples involve water and gas as an oxygen is.

Bigger part of world production energy uses fossil fuels which in certain way pollute environment.

Energy production and usage development is directed to bigger part of usage of renewable energy sources. These energy sources use wind energy, water, sun energy, geothermal and biomass energy.

1. RENEWABLE ENERGY SOURCES

Greater part of world energy production uses fossil fuels, besides nuclear energy. Fuels, directly or not, pollute environment. Using renewable energy sources in total energy consumption is relatively low, although it increases constantly.

The government has not ordered producers to use energies which uses fossil fuels, there are ecology harm which comes out from that kind of production, so the production prices are not coordinated.

Production development and energy usage is directed to reducing consumption to product and service, increasing the domicile sources in the production and directing to bigger part of renewable energy sources usage.

Renewable energy sources involving has many advantages which are seen through reducing the pollution and costs for that, possible application on apart and faraway places, at places with lower consumption, bigger employment. Renewable energy sources uses wind, water, sun energy, geothermal and biomass energy.

Production and consumption of renewable energy in developed countries increases every day, and in some countries is very high. (Sweden and Austria around 25%, Finland over 21%, Portugal 16%).

In EU countries, in different ways, usage of renewable energy sources is stimulated. Republic of Macedonia has good opportunities for sun energy supplying.

Sustainable development is a concept of continuous economic and social development and improvement, with no damage for the environment and people goods. It demands that renewable stuff, like water and energy, don't spend faster than sustainable, renewable sources can make up for them.

Today's, conventional energy sources in great measure are fossil fuels and they participate in total production with 85-90%. The most important among them is oil

(35-36%), and coal and gas are equally present. Fossil fuels are classified and not renewable. Across the world, more and more the concept of renewable energy sources is understood. In table 2, consumption of all types of energy across the world is shown:

Table 2.: Energy consumption across the world 1970-2010 (quadrillions) x 10¹⁵ MJ/m²

Energycences	1970	1990	Prognose for 2010
Oil	97,8	135,4	181,3
Natural gas	36,1	72,0	103,3
Coal	59,7	91,7	118,0
Nuclear power station	0,9	20,3	24,4
Renewable sources	12,2	26,2	41,1
Total	206,7	345,6	471,4

Consumption of all types of energy increases, but the biggest consumption demands renewable energy sources supply. Predicted increasing of energy consumption, from renewable energy, contains hydro power stations, geothermal energy, biomass and sun energy.

1.1. Renewable energy sources in European Union

European Union is consisted of countries which have less energy sources, so they are forced to import fossil fuels. In a way, their self being is hurt, they depend on oil, coal and natural gas prices. Therefore EU countries are aiming to:

1. Small hydro power stations are of a great importance, water power is confirmed a long time ago, it enables great energy production.
2. Wind-electric power is gained using wind turbines. Installed capacities for wind energy, in 1995 were the biggest in Germany, smaller in Denmark and United Kingdom. Electric power gained by the wind is the cleanest type of energy of course.
3. Sun energy is used by application of active and passive systems, also photo-voltage cells. Biggest users are Greece and Germany. Photo-voltage cells contain enables electric energy production, but its application is still law.
4. Geothermal energy is used for electric energy production in smaller limits, in a way of using geothermal warmness of Earth inner. In Europe, Italy has greatest number of geothermal units, and the biggest geothermal power stations is settled in Toscana 1991. Geothermal energy is the most important renewable energy source after hydro energy.
5. Biomass is important source for production of heat, bio-fuel, electric power, its main tool are its potentials. Biomass contains wood and its waste, various "energy" agricultural cultures (corn, sugar tree) Bio-fuels are gained from biomass, and by their gathering electric power and heat are produced. The biggest electric energy producers from biomass are France, Germany, Ireland and Netherlands. About 59,5% from all renewable sources are from biomass in mentioned countries, gained energy is used for heating houses, local heating, electric power production and bio-fuel.

Great importance of renewable sources energy is gained from ecological effects (renewable energy sources don't produce SO², SO³, NO, or cells).

1.2. EU legislative for renewable energy sources

For providing higher usage of renewable energy sources it's necessary to stimulate their usage, adopt various programs according to the energy politics and environment protection politics. In that direction, national and municipality law is improved, special articles are put on this issue at public counting, scientific programs are done by energy priorities, wide action for environment protection are done.

At the end of 1996 in EU special document is adopted called Green Paper, in which directions for energy politics are given, and confirming measures for usage of renewable energy sources. Also, a document White Paper is adopted. All EU countries took an obligation for changing relationship in energy sector, linked to liberalization of electric energy and gas market. In these programs Italy, France, Spain and Greece lead, but also Denmark, Austria, Sweden and Finland.

2. ENERGY CONSUMPTION ANALYSES IN SERVICE ACTIVITIES CONCERNING TOURISM AND HOSPITALITY

Basis for strategy for energy sector development building are predicting the energy consumption. This prediction could be provide qualitative only on basis with correct energy consumption data.

As a basis for building the strategy for energy sector recording of current energy needs id necessary to be done. Because of different steps of growing it's useful to overview houses sector, services and industry separated.

2.1. Energy consumption in hotel industry

From services sector especially tourism and hospitality are overworked.

Objects in tourism and hospitality are heated mostly by heat pumps. Less part of objects are heated by central heating, and a third of the objects is not heated, concerning that tourism is bigger part season tourism.

Way of heating in objects in tourism and hospitality mostly is: central heating, heat pump, separate ovens and there are non heated objects, too.

2.2. Energy consumption in hotel industry in Ohrid as a tourist center in R. Macedonia

Republic of Macedonia is on the limits between continental and Mediterranean influences. According to the fact that country is settled at the most southern part of north, continental area, and to belong in sub-tropic area, Republic of Macedonia belongs in sub-tropic area, so Republic of Macedonia is different from all other climate characteristics. Besides that Republic of Macedonia is not open to the sea, vicinity of Adriatic and Aegean has extremely Mediterranean influence on modifying continental climate.

It catalyzes extreme values of continental climate elements, which positively influence tourist stay.

Air temperature is a factor which points out on convenience in tourist activity, because it shows heat conditions of a space. This condition affects air temperature during a day and a year. For tourism, important data is average air temperature yearly and monthly considered.

Tourism in Republic of Macedonia is connected to especially season concentration of visitors, so therefore conveniences for tourist activity in that area.

The highest average yearly air temperature in Republic of Macedonia is 14,5⁰C. Monthly temperature is the highest during summer period. In VII and VIII month average monthly temperature is 20⁰C, which shows an optimal opportunity for doing tourist activities. During period VI-IX month, half-monthly temperatures enable swimming activities, having sun in lake tourist places in Republic of Macedonia (Ohrid, Prespa and Dojran Lake). In Ohrid-Prespa region, depending on temperature conditions, Mediterranean influence can be noticed, which positively affects tourist development.

Republic of Macedonia is a country for long-lasting sun presence, which is also very important tourist value. Yearly, in Ohrid there are 2233 hours in sun, in Resen 2205 hours in sun, in Dojran 2609 hours in sun. This element is of a great importance for usage of sun energy in Republic of Macedonia.

All these facts show that in Ohrid region there are more than excellent conditions for tourism during summer and winter, so hotel industry must provide pleasant stay for tourists in any way, especially concerning heating the objects during winter and cooling them during summer period, for which energy is necessary. Energy in hotel industry is needed for hot water, for cooking, for lightening, and supplying other techniques, so the visitors would have pleasant, sure and comfortable stay.

Researches had been done at biggest hotels in Ohrid, the most important ones, not considering some small hotels which had grew up privately on Ohrid Riviera.

Warm season in Ohrid is IV – X month of year (7 months). So, there has to have considerably thought about energy providing, especially in objects, cooling is needed during summer time, but temperatures are not that high and no big cooling is needed, because the climate is pleasant. Analyses done about energy consumption, kind and energy condition in Ohrid hotels is shown in Table 3.

It can be noticed that oil, electric energy and gas are main energy source at hotel industry in Ohrid hotels. About renewable energy sources at these hotels it's early to talk about, a state strategy should be overworked, which had been started to be done, already.

From the table it can be seen that not in one hotel (from the ones taken in this analyses), there is no central heating, because Ohrid doesn't have central heating as a town. Ohrid has only individual heating for each hotel, which has its own system for heating, fed by electric power/oil. In 90% of hotels in Ohrid there are sun collectors, which is good. In kitchen, in hotels, for cooking, electric power and gas are supplied. At 90% of hotels, besides basic heating, there is air conditioning cool and hot, and at all, 100% of hotels, there are additional heaters, for reserve needs. In 35,7% examined hotels in Ohrid there are sun collectors, and in 64,3% there are no sun collectors, which points out the fact that sun energy as a renewable energy less included and it should be involved in usage at all hotels.

Table 3.: Condition, consumption and heating kind at most important hotels in Ohrid, Republic of Macedonia

Hotel's name in Ohrid	Number of rooms	Central city heating	Individual heating with pump	Energy types for heating /cooling	Type of energy in kitchen	Cooling	Energy type	Sun collectors	Electric power aggregates	Additional means for heating/ cooling	Other energy sources (also renewable)
Milenium	53	non	yes	Oil/solar	Electric power/gas/coal	Air conditindable	Electric power, gas, oil, coal	yes	yes	Yes, heaters heat/cool	non
Granit	119	non	yes	Oil	Electric power/gas	Air conditindable	Electric power, gas, oil	non	yes	Yes, heaters heat/cool	non
Inex Gorica	125	non	yes	Oil/solar	Electric power/gas	Air conditindable	Electric power, gas, oil, solar	yes	yes	Yes, heaters heat/cool	non
Park	92	non	yes	Oil	Electric power/gas	Air conditindable	Electric power, gas, oil	non	yes	Yes, heaters heat/cool	non
Metropol	120	non	yes	Oil	Electric power/gas	Air conditindable	Electric power, gas, oil	non	yes	Yes, heaters heat/cool	non
Belvi	180	non	yes	Oil	Electric power/gas	Air conditindable	Electric power, gas, oil	non	yes	Yes, heaters heat/cool	non

(continued)

Hotel's name in Ohrid	Number of rooms	Central city heating	Individual heating with pump	Energy types for heating/cooling	Type of energy in kitchen	Cooling	Energy type	Sun collectors	Electric power aggregates	Additional means for heating/cooling	Other energy sources (also renewable)
Desaret	300	non	yes	Oil	Electric power/gas	Air conditindable	Electric power, gas, oil	non	yes	Yes, heaters heat/cool	non
Belvedere	60	non	yes	Oil/solar	Electric power/gas/coal	Air conditindable	Electric power, gas, oil	yes	yes	Yes, heaters heat/cool	non
Sonceva porta	15	non	yes	Oil	Electric power/gas	Air conditindable	Electric power, gas, oil	non	yes	Yes, heaters heat/cool	non
Donco	49	non	yes	Oil	Electric power/gas/coal	Air conditindable	Electric power, gas, oil	non	yes	Yes, heaters heat/cool	non
Tino	30	non	yes	Oil	Electric power/gas/solar energy	Air conditindable	Electric power, gas, oil, solar	yes	non	Yes, heaters heat/cool	non
Dva bisera	11	non	yes	Oil/solar	Electric power/gas	Air conditindable	Electric power, gas, oil, solar	yes	yes	Yes, heaters heat/cool	non
Garden	32	non	yes	Oil	Electric power, gas	Air conditindable	Electric power, gas, oil,	non	yes	Yes, heaters heat/cool	non
Klimetica	45	non	yes	Oil	Electric power, gas	Air conditindable	Electric power, gas, oil	non	yes	Yes, heaters heat/cool	non

In Table 4, aim for energy consumption and way for its gaining and supplying is given.

Table 4.: Aim of energy consumption

Aim of energy consumption	Central heated objects/individual heat	Number of objects heated by heating pump	No heated objects
Heating (MJ/m ²) heating space	Individual heating	14	non
Hot water (MJ/m ²)	Individual heating	14	non
Cooking (MJ/m ²)	Individual heating	14	non
Unheated energy (MJ/m ²)	Individual heating	14	non
Cooling (MJ/m ²)	Individual heating	14	non

A lot of energy is needed for hotels functioning. Therefore, but with aim of improving, consumption new types of energy, it must be worked on this issue, new energy sources should be involved, sun energy should be involved in all hotels, then it should be thought for other renewable types of energy, so total consumption would improve, environment protection, tourists health protection, economic effects, by that the legislative will be fulfilled and EU entrance.

CONCLUSION

By made analyses of energy consumption condition in hotel industry in Ohrid RM, concerning 14 most important hotels in Ohrid, it can be concluded:

1. Energy is necessary for human life, in all her kinds, and with no energy human association could not function.
2. Nowadays mostly conventional energy sources are used, oil, gas, coal, electric energy gained in thermal power stations, hydro power stations, nuclear power stations.
3. In RM mostly used energy is electrical, then gas, oil, coal.
4. Sun energy with sun collectors is already in use, because in RM, especially in Ohrid there are lot of sunny hours.
5. In European Union already there is a legislative for renewable energy sources.
6. In tourist industry in Ohrid mostly used is electric energy, gas, oil, coal and less sun energy.
7. There is no city central heating in Ohrid, only individual heating at each hotel.
8. Renewable energy sources are present only through sun energy, there are other types of renewable energy sources.

9. Overwork and usage of new types of energy are recommended, by which ecological and economy effects will be achieved, human health protection, especially tourists.
10. Overwork of renewable energy sources projects and their application is basic condition for entering the future, more energy and more energy types must be provided, legislative for that and European Union entrance.

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