POSSIBILITIES OF FREE TOOLS, IN INFORMATIVE CALCULATION OF THE ENERGY PERFORMANCE OF THE HOUSE IN THE SLOVAK REPUBLIC

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ABSTRACT

In the development of a sustainable society and an active approach to environmental protection, it is essential to focus on building energy efficiency and its increasing. Within the member states of the European Union, the process of increasing the energy performance of buildings is ensured by increasing the requirements for new buildings through legal and technical standards. This process is supported financially by various EU funding programs. One of the useful helpers in spreading awareness of the energy performance of buildings and at the same time being interested in building it is the ease and availability of information about building parameters in which people live or own. Information technology that is closest to contemporary human beings compared to information brochures or publications in paper form may be helpful to achieve that goal.

This contribution provides insight into the possibilities of freely available resources and tools in the Slovak Republic, which can help owners or residents of older homes to informally calculate the energy performance of a home. Through these freely available resources and tools, in particular, the lay public can easily and freely obtain information about the characteristics of their homes in the Slovak Republic and at the same time find out how it would be possible to reduce the costs of consumed energy.

Keywords: calculation of energy efficiency of a house, heat loss of a building, internet applications, energy education, consumption for heating of buildings

INTRODUCTION

One of the main problems in the energy performance of buildings is their efficient use, provided that the necessary temperature regime is maintained [1]. All conditions not only of sufficient energy in the winter period but also of heat removal from the buildings during the summer season must be observed. Energy supply, not only in industry but also in public services, is one of the main challenges [2]. The cost of energy needed to fully operate a building is one of the existing components of current spending.

At the same time, the demand for new buildings is constantly increasing through legal and technical standards [3]. Directive 2010/31 / EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings entered into force on 8 July 2010. Any new building built after 2020 across the European Union will need to obtain the energy certificate of the lowest energy class [4]. In the Slovak Republic, this Directive of the European Parliament and of the Council 2010/31 / EU is implemented by Act No. 300/2012 Coll. amending and supplementing Act no. 555/2005 Coll. on the energy performance of buildings and, at the same time, by the implementing Decree on energy certification of MDVRR SR no. 364/2012 Coll.

Nowadays, under the pressure of ever-increasing energy costs, the population is also increasingly focusing on the energy performance of buildings and is interested in energy savings [5] [6].

Therefore, it is also an important, active role of the state in promoting publication and dissemination with information brochures and professional publications.

CALCULATION OF ENERGY EFFICIENCY OF A HOUSE

The energy model of a building can be obtained in several ways [1]. One of them is to create a model based on measuring energy consumption and generating additional energy from human or outdoor activities [2]. When building a model of building energy consumption based on consumption measurements, external conditions as well as additional resources such as the presence of people, it can be based on the black box method. From the input data obtained, such as e.g. external temperature, wind speed, air humidity, cloud or rain, whether the number of people in the building and the type of activity they are dealing with and measured output data such as electricity, gas, heat energy for heating or DHW production can be created model of the object.

In the first case, we will focus on creating a simple building energy model based on the measurement of energy inputs and external temperature in the form of

$$y = A * x \qquad (1)$$

where y - the energy consumed in the building

A - the energy model of the building

x - outside temperature

Given the set of above-mentioned requirements for informing and educating the population through simple information on building energy parameters, this paper focuses on an overview of free resources and tools available in the Slovak Republic that can help owners or residents of older homes in the informative calculation of the energy performance of the house [7].

In the following, we will briefly compare some freely available portals and calculators to calculate heat losses, or calculators to calculate the energy performance of buildings. In the process of comparing internet portals, we first briefly describe the individual web portals and institutions they represent. In the evaluation of internet portals, we will take into account in particular what content categories the portal contains. These will be recorded for clarity in a table using logical logical variables yes or no.

Calculator for calculating heat loss SSE

First, we selected the information portal of the energy company Stredoslovenská energetika, a. s. based in Žilina. Stredoslovenská energetika offers a calculator for calculating heat losses [8]. When entering data, the user has limited options in the input data, which is a separate house building, row house or multi-storey house. Consequently, this calculator is not suitable for apartment buildings. Next is the selection of the year of construction. On the basis of this, it is evident in this calculator to calculate the typical building materials for a given construction period. In the next selection, the entry data for the building's location and room location with respect to heating are entered. This is followed by parameters of external climatic conditions through wind force and minimum outdoor temperature.

Furthermore, the number of exterior walls must be characterized by the type of windows and the glazing of the window area. Similarly, to the desired internal temperature, 3 options describe the quality of the thermal insulation.

The last parameter is the heated area of the room or the whole building in square meters.

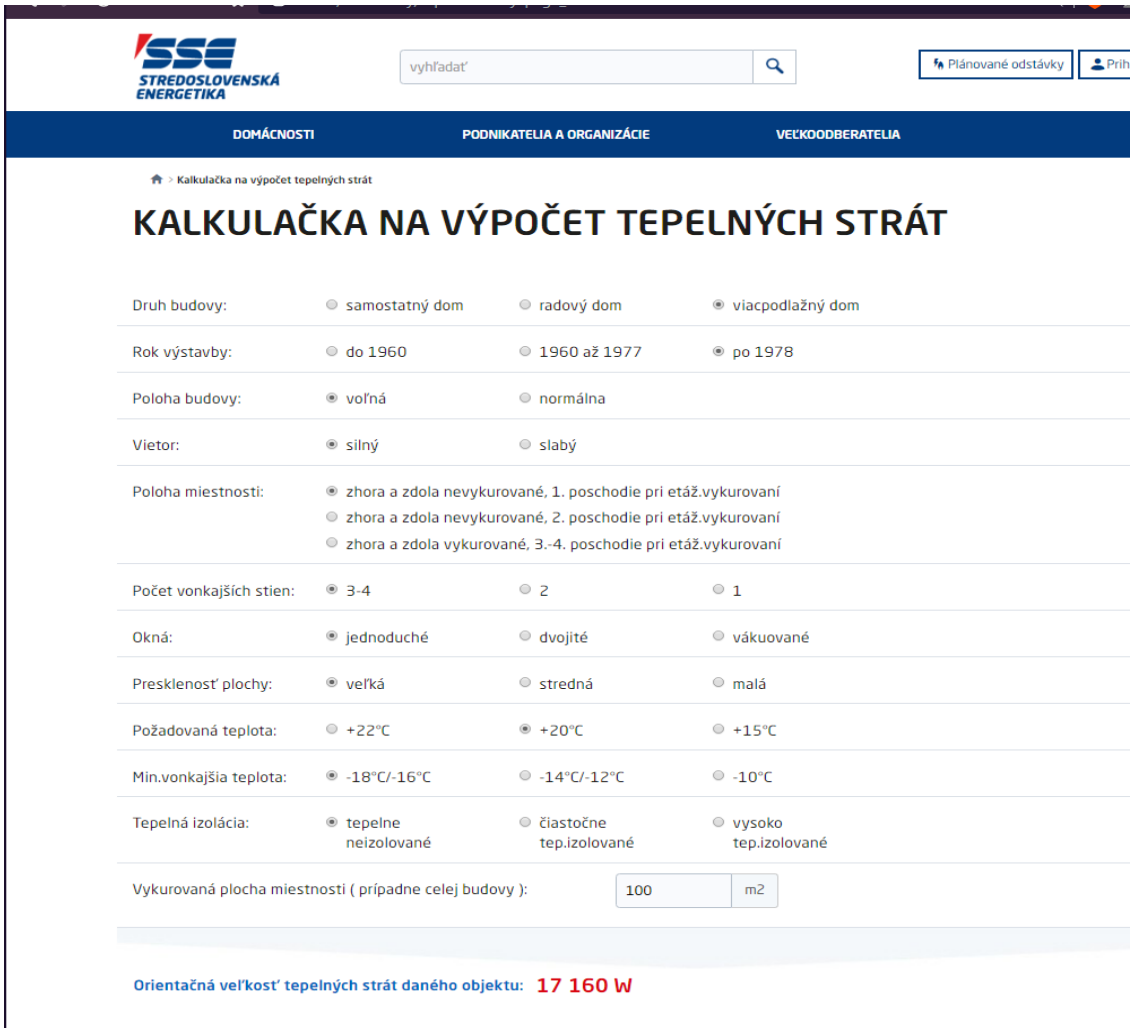

Figure 1 Calculator for calculating heat loss SSE [8]

Calculator for calculating heat loss MSD

Furthermore, we tried to bring the calculator of heat loss calculation to MSD Company spol. s r.o., which deals with business activities in air conditioning, ventilation, heating ventilation and heat pumps, MSD offers a tool for calculating heat losses that will help the user to calculate the heat loss of the building [9].

When using a given calculator, it is necessary to enter several variables such as eg. heated area (m2), height of room (m) of perimeter walls, wall thickness (m), type of insulation layer eg. polystyrene or mineral wool, insulation thickness and the like. In addition, it is necessary to specify the type of glazing (eg single or double glazing) or double glazing or triple glazing. A very important quantity of glass in the total area.

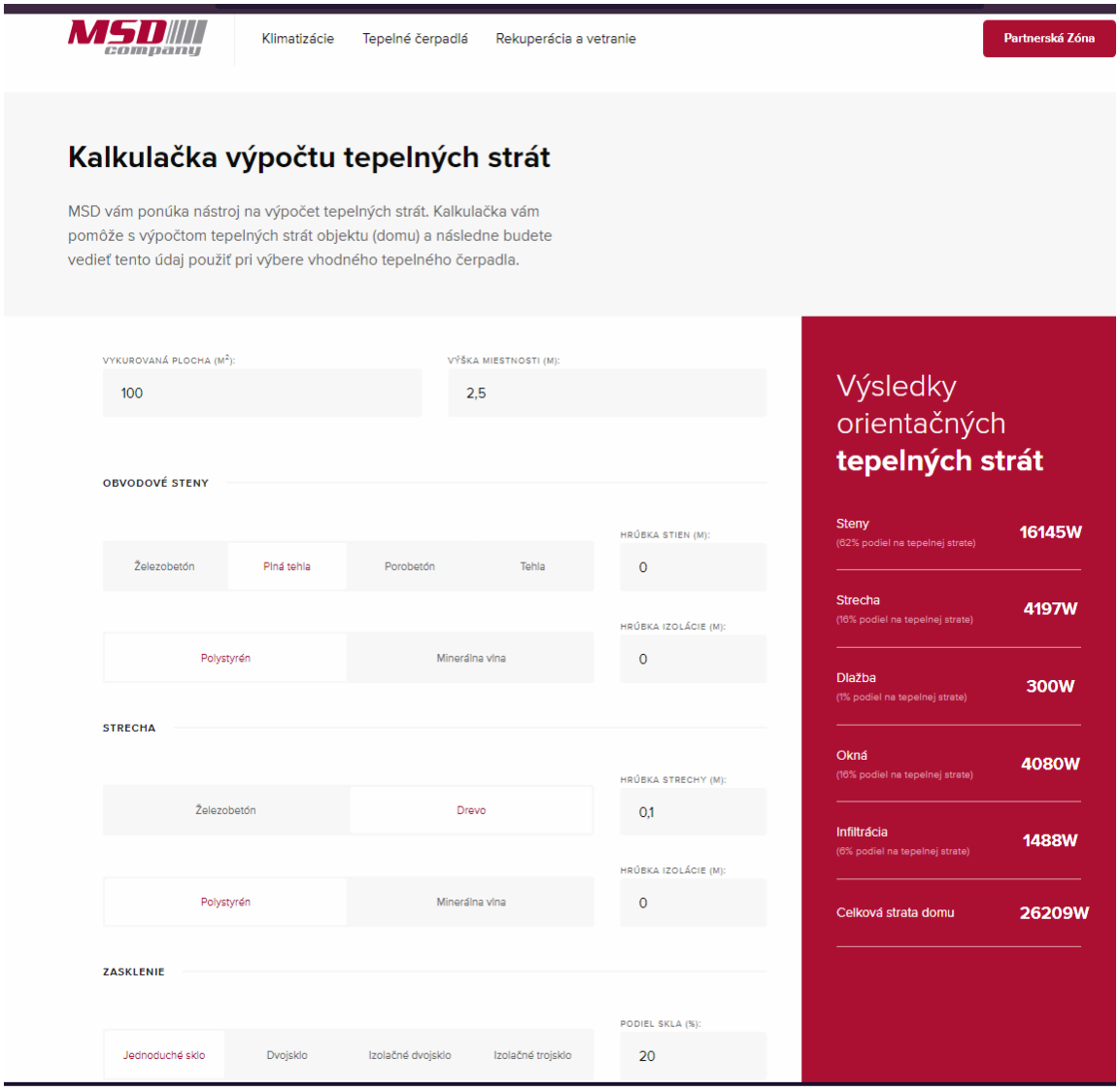

Figure 2 Calculator for calculating heat loss MSD [9]

Energy Performance Calculator from SEIA

The Slovak Innovation and Energy Agency was established as a state contributory organization by decision of the Minister of Economy of the Slovak Republic The tasks of the SIEA in the field of energy are determined by the Slovak legislation as follows [10]:

SIEA collects and evaluates data on energy efficiency and the use of renewable energy sources in the Slovak Republic and also prepares documents for the amendment of energy legislation.

Furthermore, SIEA represents Slovakia in international energy projects, or acts as an intermediary body and implementing agency for EU structural funds.

At the same time, the SIEA provides free energy advice to households, entrepreneurs and the public sector, but also ensures the operation of an energy efficiency monitoring system and tests energy specialists.

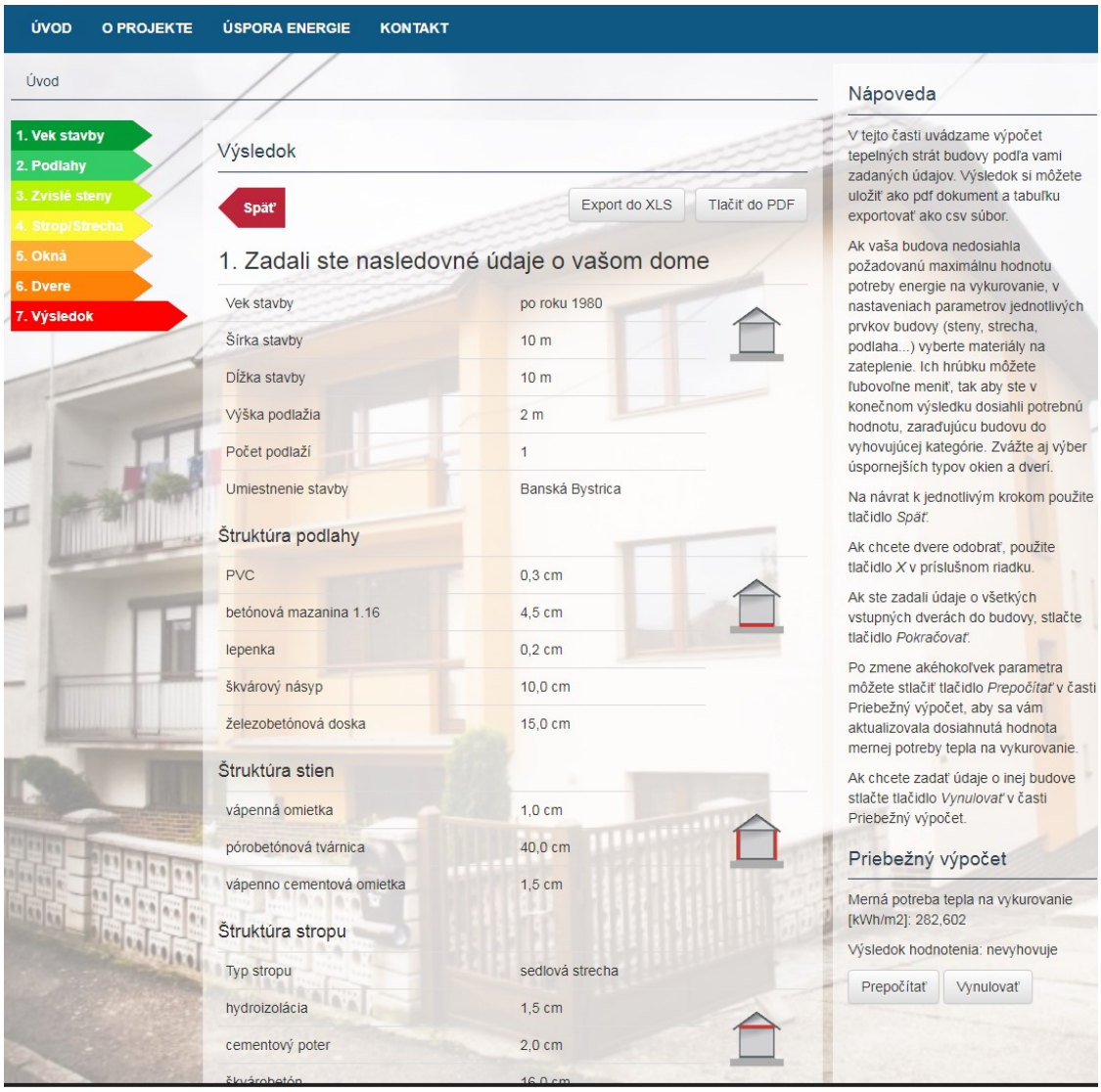

Figure 3 Calculator for calculating the energy performance of buildings from SIEA [10]

The SEIA Energy Performance Calculator was developed as part of the European Request2Action project. This project is characterized as [11]:

"The Request2Action Project was an initiative deployed by the European Commission, IEE Program (2014-2017), which involved nine European countries, focused on the use of the data available in the Energy Performance Certificates (EPCs), alongside other data, promote home energy efficiency. The results address new approaches to make EPC data useful for governments, private companies, and individuals." [11]

SEIA's Building Performance Calculator uses multiple data groups such as age construction, flooring, wall structure ceilings and roof. Each group requires multiple data.

For the purpose of comparing individual calculators, we can create a comparison table in which the names of individual input variables or functions and the presence of a given quantity in the calculation of energy balance within a particular calculator with a given functionality are given.

Table 1 Comparing individual calculators

	SSE	**MSD**	**SIEA**
Age of the building	yes	no	yes
Building dimensions	yes	no	yes
Building location	no	no	yes
Building shape / Area	no	no	yes
Type of building windows	yes	yes	yes
The size of the building windows	yes	yes	yes
Materials / Building insulation	yes	yes	yes
Roof	no	yes	yes
Desired internal temperature	yes	no	no
Min. outside temperature	yes	no	no
Export calculated data	no	no	yes

The possibility of using individual energy calculators, to compare the results obtained from individual calculations as well as the proposed improvements are a prerequisite for more effective decision making in the implementation of modifications. It is only natural that by using these tools one gets a multi-dimensional view of the issue and also an overview of which variables have a greater impact on the change in the overall

energy balance. The next step in this issue will be to find and identify the necessary energy savings for different material and financial costs.

On the basis of comparing the quantities belonging to individual calculators and on the basis of the energy model values obtained, the general public can choose which calculator to use. It is not only the provision of several possibilities for obtaining the same quantities that laics will learn not only to orientate themselves in the energy efficiency of the house, but also to make more effective decisions in this area.

CONCLUSION

The basis for the development of a sustainable society as well as an active approach to environmental protection is to motivate people to raise awareness of the energy performance of buildings.

In synergy with this, it is necessary to financially support this process with various subsidy programs and the effective use of European Union funds.

An active approach to environmental protection and the rational use of renewable energy sources also encompass education and training through easily accessible information about building parameters in which people live or own.

One of the indispensable needs for sustainability development is in the context of constantly evolving information and communication technologies (ICTs) to use the tools and means to provide, process and evaluate a wide range of information on the energy performance of buildings.

Through these freely available resources and tools, in particular, the lay public can easily and freely obtain information about the parameters of their homes in the Slovak Republic and at the same time find out how it would be possible to reduce the costs of consumed energy.

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