THE NEED FOR A COMPREHENSIVE ASSESSMENT OF INPUT DATA IN THE TECHNICAL AND ECONOMIC ASSESSMENT OF THE SPECIFIC PROJECT

MONIKA FEDORČÁKOVÁ – ERIKA LIPTÁKOVÁ – JURAJ ŠEBO

Abstract: *The reason for the growth in energy demand is population growth, rising living standards, the use of leading technology and comfort of mankind. Despite austerity measures and a more efficient use of energy and natural resources will continue to increase its consumption. It is necessary to discover and implement solutions that will be exploit in addition to conventional energy sources, which are indispensable in certain areas, renewable resources too. Currently, the focus on an exploitation of geothermal energy, which may in the near future, partly replace conventional sources and thus contribute to reducing environmental damage. The present contribution approaches and certain assumptions, to be considered for projects where they are used in conjunction traditional as well as alternative energy sources. Contribution also presents the assessment methodology used in the implementation of management solutions renewable energy in Thermal park Besenova, which is the result of cooperation between the Thermal Park and the Technical University of Kosice. The paper presents selected results of the evaluation of specific objects, for given values of the input variables. Each project and not only project using alternative energy sources need to be responsibly assessed. And techno-economic evaluation must be building on quality inputs, that contribution also outlined. Because the owner is not interested in investing in energy saving measures without having to return his investment. This paper describes the steps in the methodology selected techno-economic evaluation of a particular project too.*

Keywords: *Technical and Economic Assessment, Energy Sources, Thermal Balance, Heat Loss, Renewable Energy.*

JEL Classification: *Q5, Q2*

1. INTRODUCTION

Energy consumption will continue to increase in spite of corrective measures and the efficient use of energy and natural resources. In nature, we have a large number of energy sources and it is assumed that it is the use of alternative energy sources will play a major role in dealing with current and future energy and global problems of mankind. Geothermal energy is one of the alternative energy sources, which can also according to [1] to replace non-renewable energy sources and also reduce negative effects on the environment. When evaluating projects, and when evaluating projects using alternative energy sources too, it is a need for a comprehensive assessment of all the input data, which include the assessment of the quality of heat loss of the building, thermal balance and thermal regime of equipment, also technical and economic evaluation in order to find the profitability of the project, various measures and their proper timing.

The project which is currently underway, for which participate Technical University of Kosice and Thermal park Bešeňová, is aimed precisely at increasing the use of alternative energy sources and in cooperate with a centralized heat supply system, more in [5].

2. SELECTED ASSUMPTIONS IT IS NECESSARY TO CONSIDER THE ASSESSMENT OF PROJECTS ORIENTED TO THE USE OF ALTERNATIVE SOURCES

2.1 Measurement of heat loss of the building as an important prerequisite in assessing

Contactless measurement by thermal imager it is currently the one and only reliable method that can detect the complex range of thermal condition of buildings. Thermal imagers can confirm the quality of insulation work by performing control measurements. According to [2] only thermography reveals the actual condition of the structure. It is recommended to perform it before the final inspection of the building.

Also according to [2] is thermography able to accurately measure and assess: thermal bridges and heat loss in buildings, heat losses in building construction, can check the insulation and construction work, the efficiency of thermal insulation, waterproofing, damp proofing, precipitation pair - formation of mold, bugs insulation of floors, walls, roofs, windows, doors and more.

2.2 Assesment of thermal balance and thermal regime of buildings and facilities as other prerequisites

Important factor in the draft of heat source is: energy balance, respectively a summary of the parameters and factors that influence energy consumption.

It consists: balance of power, heat loss from of building, and the heat input system of connecting values of fuel consumption [3] [4] [7].

The balance of power with the task of quantifying the amount of incoming and outgoing energy, according to [4] applies to the following factors:

- heat loss by passing from the interior to the outside and ventilated,
- heat losses and gains passage and ventilation compared to adjacent zones,
- usable internal heat gains, ie the amount of heat used from internal heat sources,

- utilized solar heat gain,
- heat loss of the heating system in the production and distribution of heat, combustion gases and regulation,
- influent energy to the heating system.

2.3 The necessary technical and economic evaluation of the project

Technical and economic evaluation is an important part of all projects [5]. No building owner will be interested in investing in energy saving measures without having to return on his investment. According to [6] for this purpose can also be used indicators such as gross rate of return, net present value, but mainly ratio of net present value, based on which determines profitability of individual measures. Among the expected benefits of investment are financial benefits as an increase in production volume, increase revenues, reduces costs, increase profits, increase market share, and the like. Also Non-financial benefits as: reducing the burden on the environment, improve working conditions, improve social welfare and so on.

Investment in the project should include items such as: design, project management, quality control, control of supply, construction and assembly too.

Table 1 Technical and economic evaluation of the building

OBJECT NUMBER	OBJECT NAME	HEAT LOSS (kW)	DESIRED TEMPERATURE from-to °C
1	Penzion GIGA	130	20 - 23
2	Hotel THERMAL	130	20 - 23
3	Hotel LUKA	80	20 - 23
4	Hotel GIO	95	20 - 23
5	GIO hostel	60	20 - 23
6	Restaurant BABU	40	20 - 23
7	Restaurant KOLCHURY	49	20 - 23
8	Relax BAR	50	20 - 23
	THE VALUE OF LOSSES kW		
TEMPERATURE GRADIENT (kW/°K)	**SUMMER**	**WINTER**	**AVERAGE VALUE**
3,4	-34,2	130	82,1
3,4	-34,2	130	82,1
2,1	-21,1	80	50,55
2,5	-25,0	95	60
1,6	-15,8	60	37,9
1,1	-10,5	40	25,25
1,3	-12,9	49	30,95
1,3	-13,2	50	31,6
		TOTAL	**400,45**

TECHNICAL AND ECONOMICAL EVALUATION	***formula:* AVERAGE VALUE*365*24*ENERGY PRICE**
	192 936,81

Table 2 Technical and economic evaluation of pools

OBJECT NUMBER	OBJECT NAME	HEAT LOSS (kW)	DESIRED TEMPERATURE from-to °C
1	Relaxing Sitting Pool	135	20 - 23
2	Swimming Pool	80	20 - 23
3	Relaxing Sitting Pool	115	20 - 23
4	Relaxing Couchette	98	20 - 23
5	Relaxing Thermal	100	20 - 23
6	Relaxing ČAŠA	150	20 - 23
7	Pool	155	20 - 23
8	Tobog. Swimming pool	130	20 - 23
9	Relaxing Mara	165	20 - 23
10	Children Pool	120	20 - 23
11	Swimming pool	160	20 - 23
	THE VALUE OF LOSSES kW		
TEMPERATURE GRADIENT (kW/°K)	**SUMMER**	**TEMPERATURE GRADIENT (kW/°K)**	**SUMMER**
3,6	-0,4	135	67,7
2,1	-0,2	80	40,1
3,0	-0,3	115	57,65
2,6	-0,3	98	49,15
2,6	-0,3	100	50,15
3,9	-0,4	150	75,2
4,1	-0,4	155	77,7
3,4	-0,3	130	65,15
4,3	-0,4	165	82,7
3,2	-0,3	120	60,15
4,2	-0,4	160	80,2
		TOTAL	705,85

TECHNICAL AND ECONOMICAL EVALUATION	**340 078,53**

Table 3 Technical and economic evaluation objects

OBJECT NUMBER	OBJECT NAME	HEAT LOSS (kW)	DESIRED TEMPERATURE from-to °C
1	Lighthouse	94	20 - 23
2	Tent	58	20 - 23
	THE VALUE OF LOSSES kW		
TEMPERATURE GRADIENT (kW/°K)	SUMMER	TEMPERATURE GRADIENT (kW/°K)	SUMMER
2,5	-0,2	94	47,1
1,5	-0,2	58	29,1
		TOTAL	76,2

TECHNICAL AND ECONOMICAL EVALUATION	**36 713,16**

Evaluation of the effectiveness of investments and by [6] consists of:

- assessment of the effectiveness and feasibility of the project,
- knowledge capital expenditure and expected cash proceeds of the investment project,
- return on funds of recovery and estimates of additional revenue that can be expected in the future.

3. EXAMPLE OF TECHNICAL AND ECONOMIC EVALUATION OF CONCRETE OBJECTS

Key technical inputs in this concrete example for technical assessment are: heat loss, the required temperature, an appropriate temperature gradients.

4. EVALUATION OF PROSPECTS OF GEOTHERMAL ENERGY SOURCES

Centralized heat supply system is, and probably will remain a natural monopoly and therefore the heat price will remain regulated price, subject to the approval of state authorities [7]. Given the projected increase in fuel prices on world markets, it can be assumed that the price difference between the heat from geothermal sources will decrease in future, which will favor the connection of geothermal resources for central heat supply system in the city. It is expected that at high valuation fuel in cogeneration, heat price from that source will retain competitiveness for at least five years and after this period the growth of prices for fossil fuels will gradually favor the use of geothermal district heating system.

5. SUMMARY

Use of renewable energy is vital from an environmental perspective. A quality assessment of all input data in the implementation of technology solutions environmentally friendly is a prerequisite for the success of such projects and especially non-renewable resources. One of the projects for which co Technical University, which supports these ideas, the is development of algorithms that ensure the efficient use of alternative energy sources mentioned. Cooperation between Technical University and Thermal Park Bešeňová, as well as the use of geothermal energy with good prospects for the future, as the energy policy of the Slovak Republic focuses on the environmental aspects of energy production and consumption.This contribution is the result of the project implementation: Improving the efficiency of renewable energy (ITMS: 26220220174) supported by the Research & Development Operational Programme funded by the ERDF.

REFERENCES

[1] Energia MŽP [online]. [cit. 2015-04-21]. Available on the Internet: http://www.minzp.sk/oblasti/obnovitelne-zdroje-energie/obnovitelne-zdroje-energie/geotermalna-energia/,

[2] Tepelné mosty [online]. [cit. 2015-04-21]. Available on the Internet: http://stavba.tzb-info.cz/zateplovaci-systemy/8325-kontaktni-zatepleni-z-pohledu-tepelnych-mostu-hmozdinkami-a-jejich-prokreslovani,

[3] Tech.-ekon. posúdenie [online]. [cit. 2015-04-21]. Available on the Internet: http://www.tzbportal.sk/certifikacia/energeticke-environmentalne-ekonomicke-hodnotenie-bytoveho-domu.html-1,

[4] CENGEL, Y A. 1997. ***Introduction to Thermodynamics and Heat Transfer***. New York: McGraw-Hill, 922 s. ISBN 0-07-114109-X,

[5] ŠEBO, D., TREBUŇA, P. 2007. ***Algorithm for projecting of environmentally convenient manufacturing***. 2007, In: Trendy v systémoch riadenia podnikov. Košice, TU, SjF, 2007, p.6, ISBN 9788080738853,

[6] GUZYOVÁ, K. 2011. ***Osobitosti získavania finančných zdrojov***. In: MVK. Košice: UPJŠ Fakulta verejnej správy. p. 101 – 105. ISBN 978-80-7097-863-4,

[7] BECCALI, M., BRUNONE, S., CELLURA, M., FRANZITTA, V. 2008. ***Energy, economic and environmental analysis systems in residential buildings,*** Renewable Energy, vol. 33, no.3, pp. 366-382.

Monika FEDORČÁKOVÁ, Ing. PhD.
Juraj ŠEBO, doc. Ing. PhD.
Department of industrial engineering and management, Institute of technologies and management, SjF, TU in Kosice
Nemcovej 32, 042 00 Košice, Slovakia
e-mail: monika.fedorcakova@tuke.sk

Erika LIPTÁKOVÁ, Ing. PhD.
Faculty of Economics, EkF TU in Kosice
Němcovej 32, 042 00 Košice, Slovakia
e-mail: erika.liptakova@tuke.sk