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# Zero-energy construction technology as a barrier for strengthening the position on the market on the basis of a nearly zero-energy facility

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**Abstract**

The main aim of the following thesis is to present an analysis of the effectiveness of using alternative energy sources, when it comes to the all year round functioning of the facility on a chosen example. The starting point for a further analysis is the theoretical approach to sustainable construction in the context of the creation and strengthening barriers when it comes to reinforcing the position of a medium sized construction company on the Polish market. When forming sources of competitive advantage enterprises very often involve themselves in innovative activities such as new technologies having to fulfil the requirements set both by the investors and most importantly through changing legal conditions being put in place to protect energy resources. The following article will present the results of an analysis conducted on an nearly zero-energy facility possessing the LEED PLATINUM certificate executed by a medium sized construction company functioning on the Polish market as a general executor.


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*Keywords:* alternative sources of energy, sustained construction, competitiveness BREEAM, LEED

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## 1. Introduction

The construction industry constitutes for 32,7% of all of the waste produced [Eurostat 154], when it comes to both the production of construction materials as well as the exploitation of construction facilities, renovations, extensions and process connected to the utilization of the facility, after the exploitation of its functional and performance purposes. Construction facilities constitute a total of 40% of world energy usage and an estimate of 30% of the emission of greenhouse gases [1]. Under business – as – usual projections, the use of energy on the construction market globally could double or even triple by 2050 [2]. This data indicates the current bad practices connected to leading and executing projects and construction processes. The most crucial factor is development, as well as the modification of the legal procedures aiming for limitations and a more effective usage of resources necessary to be able to execute the later usage the facility. In order to be able to adequately present the topic a whole life cycle of a project needs to be assessed, meaning the execution of the construction process – taking into account the pre analysis done by the investor, design works, execution, using the facilities and their equipping as well as the changes in behaviour and the attitudes of its users [2]. Moreover, it is crucial to take action within not only decreasing greenhouse gases and the consumption of constructions but also within the execution of technologies supporting the disbursement of energy – i.e. alternative sources of energy, recuperation, insulation of construction partitions, applying "smart" solutions to manage the facility [2].

In order to be able to connect all of the factors, connected to construction facilities the term of "sustainable construction" has been introduced, which is to first of all have a holistic approach towards the facility on the design phase, later construction, then exploitation and finally demolition or be it any other form of last phase of the life cycle of the facility [3]. This term has many definitions, those which can be indicated:

- Improving the quality of human life while living within the carrying capacity of supporting ecosystems [4]
- Development that delivers basic environmental, social and economic services to all residences of a community without threatening the viability of natural, built and social systems upon which the delivery of those systems depends [5]

The most common is the definition taken from Brundtland's report, indicating that "development that meets the needs of the present without compromising that ability of future generations to meet their own needs" [6].

The issues connected to sustainable construction combine three aspects – the economical, social and environmental. The legal basis for defining the zero-energy buildinig is the 2010/31/UE directive and the proper norms [7].

On an international level works are conducted on climate changes and on analysing the possibilities of extending the participation of renewable sources of energy in constructions. The 2010/31/UE directive introduced in article number 9 the definition of 'constructions of close to zero-energy usage" (nZEB), which defines them as: "a construction that has a very high energy performance. The nearly zero or very low amount of energy required should to a very significant extent be covered by energy from renewable sources, including renewable energy produced on-site or nearby". In connection to this since 2021 all of the newly built facilities on the territory of the European Union must be constructions of nearly zero energy requirement, whereas public venues have to fulfil this requirement from the year 2019.

In literature we can find the following definitions when it comes to the energy parameters of constructions:

- ZEB – Zero Energy / Emission Construction – this definition in not unambiguous, scientist argue when it comes to the calculation of 'zero' – should it be connected to energy, the cost, what types of energies should be included in the balance (energy usage, lighting, storage water heater, and what is more should the definition be adapted to the type of construction [8], below a few definitions have been presented.

A net zero-energy construction (ZEB) is a residential or commercial construction with greatly reduced energy needs through efficiency gains such that the balance of energy needs can be supplied with renewable technologies [9]. Kilkis [10] proposed a new definition of ZEB: "(…) a construction, which has a total annual sum of zero energy