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Contemporary low-emissions hydrogen-based energy market in Poland: Issues and opportunities, part I

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ABSTRACT

The study presents an analysis of the contemporary market for low-emissions hydrogen-based energy in the Małopolska (also known as Lesser Poland) area – one of the major administrative regions known as voivodeships. The study, prepared as a case study, concerns the concept of a fledgling enterprise making its first steps on the regional market of fuel cells designed for stationary applications (efficient high-temperature SOFC-type cells).

Developing this type of concept is particularly significant for Małopolska, as it is consistent with one of the strategic development paths projected for the region, and it may also help solve a number of problems related to access to reliable and competitively priced electrical energy. The presented work may also provide a basis for the analysis of the low-emissions energy market and the potential for the adaptation of this technology in other regions of Poland and in countries which have not yet undergone such analyses.

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Introduction

The purpose of the study, which is based on an extensive report from a project carried out by the authors and co-financed from European Union funds as part of the European Social Fund (POKL.08.02.01-12-065/10-00), is to present an analysis of the hydrogen-based energy market in Poland, and in Małopolska in particular. The research that was conducted was focused on investigating the opportunities and threats to an enterprise aiming to start producing and distributing hydrogen-based energy in Poland. The report was also intended to determine the profitability of such an enterprise and to prepare a detailed schedule and cost estimate for implementing production as well as marketing.

The formulated conclusions may be used to choose the most appropriate course of action for starting this type of business and promoting hydrogen-based energy in Małopolska.

The analysis of the data collected as part of achieving the intermediate objectives made it possible to:

- determine the ownership of rights to concepts and research results,
- analyze and estimate the market in the Małopolska voivodeship,
- analyze and characterize competing brands in Poland and abroad in detail,
- analyze the financial aspects in terms of implementation and production costs as well as profitability,

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- elaborate a plan for implementing production (cost estimate and schedule),
- analyze the marketing mix (product, place, promotion, and price),
- create a concept for the image of the company,
- prepare a marketing budget for the first three years of the company's business activity.

The first stage of the analysis performed as part of the project focused on the determination of the owners of rights to concepts and research results. This led to an initial estimation of the costs of reserving rights to trademark and an analysis of the developed technology in a business plan, in the context of entitlements related to property rights.

The second stage of the project involved the evaluation of the current size and structure of the energy market. The associated trends pertaining to renewable energy sources, including those related to the potential of hydrogen-based energy, were also determined. This stage of the project also featured a PEST analysis focusing on the macroeconomic situation of the Polish renewable energy market, and an SWOT analysis dealing with the strengths and weaknesses of implemented products and the opportunities and threats associated with introducing them to the Polish market.

The next stage consisted of a financial analysis of the implementation and production costs and the profitability of the enterprise.

A detailed schedule for the implementation of production was then formulated, with cost estimates for the delimited individual stages. Recommendations for implementing this innovative service on the Polish market were also made.

The subsequent stage focused on the marketing mix analysis, with the intention of determining the image-related and marketing capacity of the enterprise in the context of its specific business activity. The analysis was based on a detailed description of the product in terms of its technological, functional and image-related aspects. In yet another stage, all possible distribution channels and the estimated cost of setting up were described taking into account the target market. The final and most crucial part of the analysis focused on the selection of marketing tools and forms of promoting the company and its product range, as appropriate for the desired image of the company and the specific nature of the business. Based on the analysis of the marketing mix, the concept for the image of the company and the marketing goals for the first three years of business activity were set.

The marketing strategy was used to prepare a marketing budget forecasting the costs and profits of the company during the first three years following the start of marketing activity.

The present paper describes only the selected, most essential analyses of those mentioned, each in its own chapter. The conclusions drawn from these analyses made it possible to evaluate the profitability of the local energy market and its potential with regard to renewable and low-emissions energy sources. The presented recommendations may be used to determine the opportunities and threats faced when starting an enterprise dealing in hydrogen-based energy, and to predict whether this type of services is viable in terms of a

sufficiently large group of consumers and sustainable in the Małopolska region.

The presented data were mostly obtained through desk research, that is via the analysis of secondary sources. Furthermore, many issues were consulted with experts in the relevant fields to get to know their opinions and to gain additional information on the subject of the conducted research.

Analysis and evaluation of the Małopolska energy market

Preliminary market analysis

Market definition and segmentation

The electrical energy market features a set of mechanisms that allows the producers of electrical energy to resale their product for a given price in response to demand from entities such as middlemen trading in electricity or end users (mostly households).

The uniqueness of the electrical energy market stems from the very specific nature of the product. It is currently impossible to store electrical energy on a large scale. The contemporary means of storing energy with the use of batteries and storage cells can only be used to store insignificant amounts. The energy market is driven by two types of activities:

- activities related to the transfer and distribution of energy,
- activities associated with trade.

This market features four groups of participants:

- producers of electrical energy – power plants, combined heat and power plants, and producers of energy from renewable sources,
- companies trading in energy, which buy energy from producers and resell it to the customers at the end of the chain,
- companies that specialize in transporting energy,
- customers – households buying energy as a utility and other entities that buy energy for the purpose of business activity.

Producers obtain energy in various ways, the most popular of which is burning bituminous coal, but also through burning brown coal, natural gas, and, last but not least, from renewable energy sources – biomass combustion, hydroelectricity, wind power, photovoltaic cells, and hydrogen-based energy.

Market segmentation according to type of energy distribution

The energy market may be divided into two parts – wholesale and retail. The participants of the wholesale segment of the market are mainly energy producers and entities that purchase energy in order to later resell it to the end users. These participants include power plants, combined heat and power plants, producers of renewable energy, designated (ex officio) vendors – that is entities formed after the separation of

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