

A Hydrogen-driven Sustainable Marketing Strategy for Future Energy Hubs

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ABSTRACT

The purpose of this research is to determine sustainable marketing strategies for the future Norwegian energy hub, specifically emphasizing hydrogen energy. It offers a strategic plan for stakeholders in hydrogen-based energy sector, analyzing the capabilities and limitations under the field of strengths and weaknesses, and opportunities and threats (SWOT) in a macro and strategic way. The study employs SWOT and quantitative strategic planning matrix (QSPM) methods to assess all the alternative strategies. Also, at the end, an aggressive macro strategy for the use of hydrogen in the energy sector is formulated as the result of the research. The current research can be also a guide and a suitable model in formulating sustainable energy marketing strategies for Qatar as another country with huge natural gas resources, which at the same time supports sustainable development.

Keywords: Sustainable marketing strategy, Energy hub, Hydrogen, SWOT, Norway, Qatar

1. INTRODUCTION

In recent years, the world has witnessed an inevitable and increasing necessity to transition towards sustainable sources of energy. With increasing concerns about climate change and the need for decarbonization, attention to the renewable energy sector, emphasizing the use of hydrogen energy in the future, has been mentioned by researchers as a suitable solution [1]. Hydrogen, serving as both an energy transporter and a catalyst for energy-related industries, holds a significant position in the outlook of renewable energy and the creation of a more sustainable future. Its advantages, including enhanced energy storage efficiency, expanded

green production, diverse applications across industries/transportation/heating, pollution reduction, economic growth, among others, are poised to contribute to stabilization and compatibility with the environment [2].

Despite the significance and potential of this energy category in renewable energy production and storage, the majority of research efforts have been concentrated on advancing and refining hydrogen technologies, with limited attention given to marketing strategies. This represents a notable research gap within the domain of hydrogen energy because, without effective marketing, businesses are likely to encounter numerous challenges in reaching their intended audience, competing in the market, and achieving their business objectives. As the demand for sustainable and renewable energy sources continues to grow, the significance of implementing sustainable marketing strategies to establish and define a company's position in the market becomes increasingly apparent. The aim of this research is to underscore the significance of hydrogen energy and emphasize the necessity for adopting suitable sustainable marketing approaches within this sector.

In this context, SWOT analysis stands out as a valuable tool for strategy formulation. It involves a comprehensive assessment of both external factors (opportunities and threats) and internal factors (strengths and weaknesses), which aids in the development of suitable strategies. This research endeavors to leverage this tool to present a sustainable marketing strategy for a specific energy hub, with a particular focus on the significance of hydrogen.

To fulfill the research objectives, Norway, a key player in the global oil and gas industry, has been chosen as the study's focal point. At the same time, Norway stands as a leading nation in the advancement of renewable energy systems, and the promotion and

expansion of hydrogen energy feature prominently in maintaining this leadership position. Norway possesses distinct advantages, including the ability to generate hydrogen from various renewable energy sources, primarily hydropower and offshore wind turbine farms (i.e., "green hydrogen"). Also, thanks to having huge reserves of natural gas and being a leader in carbon capture and storage (CCS) technology, hydrogen production from reforming methane could be another alternative with the second priority (i.e., "blue hydrogen"). The country also aims to harness the potential of energy storage through hydrogen production, utilizing surplus electricity generated from renewable sources. With designations like "clean fuel" in maritime transport, applications spanning industrial sectors, such as ammonia production, export opportunities, a robust capacity for research and development, and substantial financial resources devoted to research and innovation in this specialized field, Norway assumes a pivotal role in the hydrogen-driven global transition toward cleaner and more sustainable energy sector. Consequently, this research will center specifically on devising sustainable marketing strategies for energy hubs, with a special emphasis on hydrogen energy in Norway.

In this work, a brief description of the literature was described in the Introduction section, and in order to comply with the page limit, a comprehensive literature review including sustainable marketing strategies [3, 4, 5, 6], intelligent energy systems [7, 8, 9, 10], hydrogen energy [2, 11, 12, 13, 14] and the role of hydrogen in the future energy hub [15] will be presented in detail in the extended version of this paper.

2. MATERIAL AND METHODS

This research is characterized as a descriptive analytical study. The study's statistical population for specialized interviews and data collection comprises all the Norwegian stakeholders engaged in the production, distribution, storage, and utilization chain of hydrogen. A targeted snowball sampling method was then employed to select a statistical sample, which includes 14 companies in the production sector, 4 actors in distribution, 2 players in storage, and 10 stakeholders involved in consumption as shown in Figure 1. It is worth noting that the sample selection process took into account the supply chain of each sector (i.e., from research and education to technology and application).

To analyze the gathered information and formulate strategies, the SWOT qualitative analysis method was utilized. This method involves the identification of

internal factors (strengths and weaknesses) and external factors (opportunities and threats) that influence energy hubs, with a particular emphasis on hydrogen energy in Norway. Subsequently, an Internal Factors Evaluation Matrix (IFE) and an External Factors Evaluation Matrix (EFE) were constructed to score these factors. Following this assessment, appropriate strategies were proposed to address or mitigate weaknesses and threats while enhancing existing strengths and opportunities. Finally, a prioritization of the final strategies was conducted using the Quantitative Strategic Planning Matrix (QSPM) method. Detailed results from each of these matrices will be elaborated upon in the forthcoming extended version of the paper.

3. RESULTS AND DISCUSSION

The SWOT model is a two-dimensional coordinate table that categorizes strategies into four groups based on internal factors (strengths and weaknesses) and external factors (opportunities and threats). In this research, these factors were initially identified, and then strategies were formulated through a comparative analysis of each factor. The accomplishments of this research regarding strengths, weaknesses, opportunities, threats, and sustainable marketing strategies within the hydrogen-driven energy hub are outlined below. It is important to note that due to the extensive number of internal and external factors, the following represents only a subset of the factors that influenced our strategy formulation. The results have been depicted in Table 1 at the end of the paper.

In the final phase of the research, the output from the IFE and EFE matrices allowed for the ranking of both internal and external factors. The findings indicated that the emphasized sustainable marketing strategies in this research fall into the SO category, which represents aggressive strategies (as the primary focus of the research). Subsequently, utilizing the QSPM method, these aggressive strategies were prioritized. The research's outcomes revealed that the strategy of "green hydrogen industry development" emerged as the top priority among these strategies.

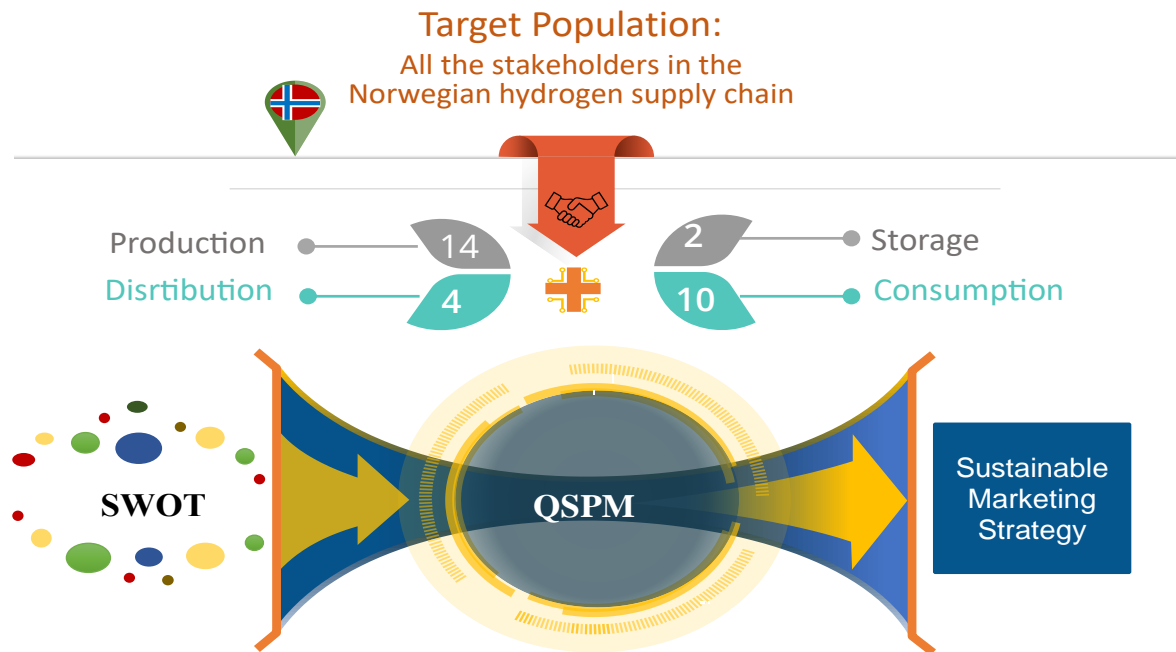


Fig. 1. The statistical population and proposed SWOT – QSPM approach

4. CONCLUSIONS



The primary objective of this research was to formulate sustainable marketing strategies specifically tailored for energy hubs, with a strong emphasis on hydrogen energy. Norway was selected as a prominent case study due to its leadership in the field of hydrogen energy hubs and substantial investments in its relevant technologies. The reason for focusing this research on addressing the marketing aspects of hydrogen energy is the importance of accurate sustainable marketing strategies in the future role of hydrogen due to the increasing demand for sustainable and renewable energies.

The current research identified four sustainable marketing strategies by using the SWOT tool, and after determining the position of the important strategies in the strategic positioning matrix based on the IFE and EFE matrices (in this study, offensive strategies - SO), the identified strategies prioritized using QSPM quantitative analysis. According to the study, the most important strategy is the development of the green hydrogen industry, which has advantages such as decarbonization and, consequently, the reduction of climate change, the ability to convert to diverse applications, reducing

dependence on fossil fuels, increasing energy security, etc. that brings the development of a green and sustainable economy to societies. The results obtained from this research can help policymakers in the field of hydrogen energy in adopting sustainable marketing strategies to strengthen and prioritize the use of this energy to create a future “hydrogen economy”.

Finally, Qatar stands out as one of the exceptional countries that, despite possessing substantial fossil fuel resources, is resolutely committed to advancing the production and storage of both green and blue hydrogen as integral components of its overarching policies. Notably, Qatar shares several similarities with Norway, including substantial investments in hydrogen technology and infrastructure, an aspiration to lead in hydrogen-based energy exports, supportive policies for this energy type's production, and the drive to diversify the applications of hydrogen energy. Given these commonalities, the research conducted here can serve as a valuable guide and an apt model for devising sustainable energy marketing strategies in Qatar. This is especially relevant for Qatar, a nation endowed with immense natural gas resources, where sustainable development is a concurrent objective.

Table 1. Summary matrix of sustainable marketing strategies for energy hubs with an emphasis on the role of hydrogen

		EXTERNAL 	
INTERNAL 	SWOT STRATEGIES	<p style="text-align: center;">Opportunities (O)</p> <ul style="list-style-type: none"> • Significant competition with fossil fuels and the need for a more sustainable alternative to them • Increasing concerns about climate change and the desire to use clean energy sources and reduce greenhouse gases • Development of international cooperation in the field of research and development of hydrogen technologies • Norway's large share in providing renewable energy and the lowest emission of greenhouse gases in Europe • The Norwegian government's goal to reduce the production of greenhouse gases due to the Paris Agreement 	<p style="text-align: center;">Threats (T)</p> <ul style="list-style-type: none"> • Competition with fossil fuels and price changes in the energy market • Creating environmental pollution due to carbon production (in the form of blue hydrogen) • High cost to create a distribution network and technology related to it
	<p style="text-align: center;">Strengths (S)</p> <ul style="list-style-type: none"> • Rich resources and high potential of renewable energy including hydropower & offshore WTs • Leader in green hydrogen production • High technology in Maritime transportation, including the utilization of batteries and liquefied natural gas (LNG) • The presence of good potential in carbon storage in very large sizes resulting from the CCS process in case of blue hydrogen • Strong experience in the renewable-based electricity generation and transport in Norway • Technology and experience in the field of hydrogen and related commercial systems 	<p style="text-align: center;">SO Strategies</p> <ul style="list-style-type: none"> • Development of green hydrogen driven industry • Encouraging the use of cell fuel vehicles • Providing sustainable hydrogen sources • Research and development • Awareness raising and education 	<p style="text-align: center;">ST Strategies</p> <ul style="list-style-type: none"> • Creating a hydrogen distribution network • Creating cooperation networks • Green marketing • Incentive policies • Continuous interaction with customers to build a sustainable supply chain
	<p style="text-align: center;">Weaknesses (W)</p> <ul style="list-style-type: none"> • High costs of infrastructure such as hydrogen production infrastructure or hydrogen fueling stations in commercial sizes • Lack of strong transportation infrastructure for hydrogen export • Lack of infrastructure for the expansion of hydrogen energy 	<p style="text-align: center;">WO Strategies</p> <ul style="list-style-type: none"> • Development of international cooperation • Development of domestic markets • Creating standards and regulations in the field of hydrogen energy • Create successful examples 	<p style="text-align: center;">WT Strategies</p> <ul style="list-style-type: none"> • Development of domestic hydrogen markets as a sustainable solution • Obtaining certificates and standards • Development of technology and innovation

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