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Diagnosis of the Development of Energy Cooperatives in Poland—A Case Study of a Renewable Energy Cooperative in the Upper Silesian Region

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Abstract: Renewable energy sources (RESs) offer key transformative potential from a societal point of view due to their modularity and ability to generate energy at the local level, allowing for the development of grassroots democratic and participatory initiatives. The paper aims to share insights into the processes of creating RES cooperatives in Poland. One of the first cooperatives to be established in the Upper Silesian region in Poland was the energy cooperative (EC) "Our Energy". This study presents an in-depth empirical analysis of a community-based renewable energy cooperative. The study employed a case study methodology, including a SWOT analysis framework, to describe the research subject and identify its strengths, weaknesses, opportunities, and threats. Key findings indicate that members benefit from stable energy prices and full recovery of the energy produced, and the cooperative is at the forefront of energy-sharing practices that minimize costs through direct transactions with the local municipality. The strategic goals of the EC focus on expanding membership, increasing the number of photovoltaic installations, implementing energy balancing, combating energy poverty, and reducing emissions. Challenges such as financial constraints and a lack of real-time monitoring of energy distribution are acknowledged, and carbon footprint reduction innovations and stakeholder engagement are highlighted as forward-looking approaches. The study highlights the role of cooperatives as a model for community-led sustainable energy initiatives. However, the study acknowledges the limitations of its small sample size, suggesting the need for broader research to understand the impact of collaborative energy on decarbonization. Future research directions are proposed, focusing on the long-term sustainability and socioeconomic impacts of energy cooperatives. This study contributes to the scholarly discourse on renewable energy cooperatives by offering insight into their potential to bridge the gap between energy producers and consumers and support sustainable community development. The main novelty of this paper lies in its detailed examination of a specific renewable energy cooperative, incorporating SWOT analysis, stakeholder perspectives, quantitative assessments, and a forward-thinking approach. This multifaceted analysis contributes to the existing literature on renewable energy initiatives, providing a valuable reference for researchers, policymakers, and practitioners in the field.

Keywords: energy cooperatives; renewable energy sources (RESs); decarbonization; sustainability; local development

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1. Introduction

The goals of the energy policies of countries around the world are, on the one hand, to increase energy efficiency and, on the other hand, to minimize the negative impact of the energy sector on the environment. The strategic direction to achieve these goals

is to increase the use of renewable energy sources (RESs) as an alternative to traditional energy sources, such as coal. New sources include solar radiation, wind, geothermal resources, water, biomass, biogas, and liquid biofuels. The energy obtained from natural processes is constantly replenished spontaneously without much human intervention. Faster deployment of renewable energy is one of the key directions for deep decarbonization of economies [1–6]. In many countries, the development of RESs is carried out with the support of governments, not only through financial incentives but also through the creation of an appropriate legal framework conducive to the development of the sector in EU countries. Each European country has set its own targets for the share of RESs in overall energy production, taking into account climate conditions, financial possibilities, and technological progress. The development of renewable energy infrastructure is a necessity to reduce greenhouse gas emissions and their effect on rising air temperatures. Countries in the Paris Agreement [5] committed to strongly reducing carbon dioxide emissions by the end of this decade. The strategic goal is zero greenhouse gas emissions by 2050 [4]. Decarbonization of economies is not easy, especially for countries that, like Poland, have been producing energy from hard coal and lignite for many centuries. Countries with mining industries overcome many barriers to achieve the intended targets of increasing the share of sources of RE in overall energy production [7–9]. The change from black energy to green energy, which is set to accelerate over the coming decades, already requires integrated action by governments, industries, suppliers, consumers, and other energy and related market players.

New forms of organization for renewable energy suppliers and consumers are emerging in the renewable energy market. One such form is the energy cooperative as a people's initiative based on the following values: self-help, self-responsibility, democracy, equality, equity, solidarity, cooperation, sharing, etc. [10–12]. One of the new forms is the energy cooperative (EC). The idea of energy cooperatives (ECs) assumes joint investments of local communities in renewable energy sources, the result of which will be additional energy obtained from "green" sources. The energy cooperative meets the needs of the cooperative members and the local community [12–14]. Owners of houses and flats on modern housing estates are interested in diversifying energy sources and, in the future, also in energy self-sufficiency. Local power producers can become self-sufficient and independent of large energy suppliers to the mass grid as infrastructure develops.

The origins of cooperatives in the energy industry can be traced to wind cooperative projects in the 1970s and 1980s. With the promotion of community-owned wind energy projects, at the same time, new RE sources developed, such as biomass boilers and solar thermal panels [15]. At that time, the European RES market created two sectors: the production of RE and the supply of electricity based on renewable sources. After obtaining the surplus energy, producers were interested in sharing renewable energy. After years of experience, the electricity market was liberalized, and more and more numbers of (powerful) energy companies started their activities. A number of cooperatives have begun to provide RES-based electricity to increase their share and control a significant part of the supply chain [15].

Energy cooperatives are very popular in European countries such as Denmark and Germany. In Denmark, there are 2.5 thousand energy cooperatives, and in Germany, there are more than a thousand. [16]. Energy cooperatives with RESs are also popular in other European countries such as Austria, Sweden, the Netherlands, Italy, France, and Spain. Energy cooperatives with RESs are a valued form of civic investment in renewable energy sources in countries actively participating in the global policy of reducing greenhouse gas emissions [17]. However, not all EU countries have as much experience in the energy cooperative market as Denmark and Germany. Poland is one of the countries with little experience. In Poland, energy cooperatives have been operating for 3 years. The first definition of energy cooperatives in Polish law was introduced in 2015 (the term was defined in the 2015 RES Act), but the detailed provisions regulating the activities of RE cooperatives were only introduced in 2018. The first energy cooperative in Poland was

registered on 11 May 2021, and it was the energy cooperative "Eisall". The area of activity of this cooperative included the Mazowieckie Voivodeship and the communes of Raszyn, Nadarzyn, and Michałowice [18]. The second cooperative was "Our Energy" (Nasza Energia), localized in Mszana in the Silesian Region. This EC, with 15 installations, was registered on 21 December 2021. Currently, 21 energy cooperatives operate in Poland (as of 13 November 2023) with 89 installations [19]. In 2021, two cooperatives were registered in the list kept by KOWR (the body responsible for keeping the register of energy cooperatives in Poland), one in the Mazowieckie Voivodship and the other in the Silesian Voivodship. In 2002, no energy cooperatives were registered in Poland, and the remaining 19 were registered in the first months of 2023 [18]. The development of energy cooperatives in Poland was greatly influenced by the RENALDO program, whose funds were earmarked for the creation of pilot energy cooperatives in selected municipalities of the Podlaskie and Kujawsko–Pomorskie Voivodeships. The program was implemented in March 2023. The program was 100% funded by the EU and the German Ministry [20]. In Poland, ECs may be established by private individuals, companies, or local government units. The cooperative is established to produce and share electricity from renewable sources [21].

The research gap the proposed study responds to is the limited empirical examination of real-world renewable energy cooperatives, especially in the context of community-driven initiatives in countries like Poland, where energy cooperatives are not widespread and are a relatively new phenomenon. The paper contributes to filling this gap by providing an in-depth analysis of the strengths, weaknesses, opportunities, and threats of the "Our Energy" energy cooperative. Additionally, it formulates and evaluates strategic goals, integrates stakeholder perspectives, and employs a quantitative assessment. This approach enhances the broader understanding of community-driven renewable energy initiatives in the scientific community.

The aim of this publication is to identify the functioning and development potential of this energy cooperative, the first in the Silesian Voivodeship and the third in Poland. The study was based on an interview conducted with the founders of the cooperative. The work consists of a review section and a practical section in the form of a case study. The case study focuses on the energy cooperative in the Mszana commune named "Our Energy" (Upper Silesia, Poland). Information about the cooperative is available on its website [22].

In the presented case study, the authors focused on (i) the operational conditions of the energy cooperative, (ii) the organizational structure of the cooperative, (iii) the strengths and weaknesses of the cooperative, and (iv) opportunities and barriers to the development of the energy cooperative. Value is added to the presented case study through the elements of the SWOT analysis conducted, which can serve as a tool in strategic planning for other energy cooperatives in Poland. This topic is very important because there are several cooperatives in Poland with little experience who would benefit from this shared knowledge. Unfortunately, today, many solutions have to be invented independently. There are no ready-made contract templates to use. Energy cooperatives need a forum for the exchange of knowledge and experiences. Even in municipalities that can cocreate energy cooperatives and employ specialists, there is a lack of people fully familiar with this topic. Prosumers are becoming an increasingly important part of Poland's energy system. Hence, there are more frequent scientific and expert discussions related to distributed and prosumer energy, including energy cooperatives.

Energy communities promote decentralized energy production, allowing local communities to generate their own power. This decentralized approach is innovative because it shifts away from traditional, centralized energy production, contributing to a more resilient and adaptable energy system [23]. The democratic and cooperative governance models adopted by energy communities represent an innovative shift in how energy resources are managed. This approach allows for more inclusive decision making, ensuring that the benefits of renewable energy initiatives are shared among community members [24]. The energy cooperative's formation itself represents a form of grassroots innovation [25]. It emerged as a response to regulatory changes in the energy sector and a desire to unite

local producers and consumers of electricity. The cooperative's activities, such as building a 112 KW photovoltaic system, directly address local energy needs and contribute to community welfare.

The cooperative model itself can be considered a form of social innovation [26]. It bridges the gap between producers and consumers, creating a collaborative platform that benefits both groups. The cooperative's emphasis on community welfare, stable energy prices, and profit sharing aligns with social innovation principles. The cooperative's response to regulatory changes in the energy sector also indicates a form of policy-driven innovation [27]. The members came together to adapt to the evolving regulatory environment, emphasizing the importance of policy dynamics in shaping the direction of energy communities.

The cooperative's ability to provide lower energy costs for its members and engage in direct energy transactions with the local municipality reflects economic innovation. By creating a system that minimizes costs for members and promotes local energy exchange, the cooperative introduces economic innovations within the local energy market [28].

The work consists of a literary part and an empirical part. The literary part presents the essence of energy cooperatives and the legal and organizational conditions for the development of energy cooperatives in Europe, with particular emphasis on Poland. The empirical part of the work presents a case study—the energy cooperative "Our Energy" ("Nasza Energia" in Polish) in Mszana (Upper Silesia, Poland). The cited case study can be used as a model in the Polish RES market at the local level. The work concludes with a discussion of the directions of development of energy cooperatives and a summary, in which the authors refer to the presented topic and point out limitations in the conducted research, as well as share their own observations on the development of the energy cooperative in Poland.

2. Background of Analysis

The industrial transformation from fossil fuels to renewable energy sources (RES) is a prerequisite for achieving sustainable socio-economic systems in the world. Sustainable development of economies, starting in the 1970s and first recorded in the Bruntland Report [29], has accelerated, in recent years, toward RESs and zero CO_2 emissions [30,31]. The net-zero strategy is difficult for countries that produce energy from hard coal and lignite, such as Poland, where 70% of the energy is black energy [32]. Barriers to the transformation of economies towards "green energy" may be a lack of funds for new investments, spatial conditions, legal loopholes, long-term administrative procedures, etc. [33,34]. With the development of industries, economies, and societies, the demand for energy and heat is increasing. Global electricity consumption is around 23,000 TWh in total. According to forecasts, global energy consumption will increase by 56%. This increase will be driven, according to the EIA report, by rising prosperity and energy demand in China and India. Together, these two countries will account for half of the total increase in global energy consumption by 2040 [35]. Therefore, governments are focusing on RESs and new forms of organization for the production and supply of renewable energy. One of the new forms of organization of energy production and supply is energy cooperatives based on RESs.

Energy cooperatives are based on citizens who jointly own and participate in renewable energy (RES) or energy efficiency (EE) projects. In energy cooperatives, citizens make the financial and economic decisions. All citizens are eligible to participate in activities. After purchasing a cooperative share and becoming a member or co-owner of local RES and EE projects, members share in the profits and often are given the opportunity to buy the electricity at a fair price. In addition, members can actively participate in the cooperative: they can decide in what and where the cooperative should invest and are consulted when setting the energy price.

Energy cooperatives (as a subcategory of energy communities) are validated by EU law: renewable energy communities (RECs) under Art. 22 of the RED II Directive and citizen energy communities (CECs) under Art. 16 of the Internal Electricity Market

Directive. In the European market, there is the European federation of citizen energy cooperatives—REScoop.eu. The federation has a growing network of 1.900 European energy cooperatives and 1,250,000 citizens who are active in the energy transition [36,37].

In the literature on the subject, an understanding of renewable energy is evident in publications [38–44]. RESs are generally characterized by lower power density levels; their use competes with other processes of the biosphere, and those with higher potential (i.e., wind, solar) are critically affected by their intermittence and variability [14]. Energy cooperatives are associations of persons, i.e., cooperatives, who set them up for a specific purpose. This is intended to secure long-term access to electricity from indigenous sources and thus energy security. ECs can also retail energy, which consists of buying energy on the market and selling it to domestic consumers (often members). The basis of cooperatives is democracy in decision making [14]. RESs allow the democratization of access to capital (or the means of production), and thus, they have the potential to contribute to the energy transition in a more socially profound way than a mere technological fix [14,15,45–50]. The involvement of local communities in the decision making and management of their resources significantly helps to mitigate the so-called effect of not in my backyard (NIMBY) [14]. Local communities are important for governments to mobilize people for climate policy [50–54].

In Poland, the term "local cooperative" refers to the Act on Cooperative Law from the 1960s. It dates back to the period of the centrally controlled economy in Poland—having been amended many times—and concerns cooperatives in a broad sense, including housing cooperatives. In Poland, the last amendment to the law on cooperatives was in the 1980s. In Poland, an energy cooperative is defined by the Act of 16 September 1982—Cooperative Law [55]—and the Act of 4 October 2019 on farmers' cooperatives [56], which specify that activity consists of the production of electricity, biogas, or heat through renewable energy installations and balancing the demand for electricity, biogas, or heat exclusively for the own use of the energy cooperative and its members, who are connected to an area-defined electricity distribution network with a rated voltage of less than 110 kV, a gas distribution network, or a district heating network.

In Poland, the EC is a new organization in the electricity market. The definition of an energy cooperative was only introduced into the Renewable Energy Sources Act in Poland in 2016, but detailed regulations regulating its activities were introduced in 2018 and 2019 [57]. In Poland, energy cooperatives may be established only in rural and rural–urban municipalities. This condition is aimed at promoting areas whose resources and conditions can be used in a particular way for the production of clean energy (construction of biogas plants using green mass or construction of wind power plants or photovoltaic farms). Cooperatives in Poland are documented in the list of energy cooperatives of the National Centre for Agricultural Support (KOWR) [58]. RES energy cooperatives are part of industrial decarbonization, as they can generate electricity only from renewable sources. Cooperative members produce renewable energy for their own needs and for others. Membership in an energy cooperative should provide energy security and economic benefits to the members [59–61].

For economies promoting renewable energy sources, there are many government support programs. In Poland, it is "My Electricity" [62]. Financial subsidies are an incentive for residents to switch from black energy to renewable energy. Solar photovoltaic (PV), wind, and biomass heating are particularly attractive technologies for citizens in modern economies. Researchers and practitioners present many aspects of community involvement in activating climate policy, giving examples of different renewable energy sources (wind, solar, water, etc.) [61–68]. With the development of the market for these technologies, the maturity of these markets, and the opportunities for combining energy-producing technologies, interest in purchasing these technologies is growing. Access to new technologies creates demand for RE. Capellán-Pérez et al. [15], based on Romero-Rubio and de Andrés Díaz [69], listed the following features of the renewable energy technology market that build demand: their maturity, modularity, simplicity, high reliability, and the availability of technical service providers.

The main characteristics of energy cooperatives are the following:

- Local energy production and consumption;
- Membership and cooperation;
- Fair cost/profit allocation.

Energy cooperatives play a crucial role in fostering sustainable and decentralized energy production and consumption. Energy cooperatives are typically formed by members who share a common interest in renewable energy, energy efficiency, or local energy generation [69–73]. Members often invest in the cooperative, either financially or by contributing resources, such as land for renewable energy projects. In return, they become co-owners and decision makers in the cooperative [74].

Those initiatives engage in various energy projects, such as wind farms, solar installations, hydropower plants, or even community-based microgrids [75]. The cooperative collectively manages the development process, including project financing, planning, permitting, and construction. Cooperative members have a say in the governance and decision-making processes [76]. Typically, each member has one vote, ensuring a democratic approach to managing the cooperative's affairs. This ownership structure promotes community involvement and local control over energy resources [77].

Energy cooperatives often prioritize local benefits. They aim to generate renewable energy close to where it is consumed, reducing transmission losses and promoting energy independence. Profits generated from energy sales or savings are reinvested in the cooperative or used for local community projects [78]. Their aim is for economic viability and competitiveness in the energy market. By pooling resources and expertise, members can negotiate better terms for purchasing equipment, obtaining financing, and selling excess energy back to the grid. Many energy cooperatives also focus on educating their members and the broader community about energy efficiency and renewable technologies. They promote awareness and provide information on sustainable energy practices [79].

Energy cooperatives contribute to reducing greenhouse gas emissions and combatting climate change by generating clean, renewable energy [80]. They often prioritize environmentally friendly energy sources, such as solar, wind, and hydroelectric power. In the face of extreme weather events or power grid disruptions, energy cooperatives with microgrid systems can enhance community resilience. They can isolate from the main grid, ensuring a stable energy supply to critical facilities during emergencies [81].

On the basis of the literature analysis, the main barriers to energy cooperatives' development were put in Table 1. It is important to note that these barriers can vary depending on the region, regulatory environment, and specific circumstances of each energy cooperative. Overcoming these barriers often requires a combination of community engagement, policy advocacy, financial planning, and technical expertise to ensure the successful development and operation of energy cooperatives [82,83].

Table 1. Barriers to energy cooperative development.

Barrier	Description
Financial Constraints	Limited access to capital and financing options can hinder the establishment and growth of energy cooperatives.
Regulatory Hurdles	Complex and often unclear regulations related to energy generation, distribution, and sales can create significant obstacles.
Lack of Expertise	Insufficient technical knowledge and expertise among members can impede the successful planning and operation of projects.
Resource Availability	Difficulty in securing suitable land or renewable energy resources like wind or sunlight can delay or halt cooperative projects.

Table 1. *Cont.*

Barrier	Description
Market Competition	Dominance of established energy companies and utilities can make it challenging for cooperatives to compete in the market.
Grid Connection Issues	Difficulty in connecting to the grid and navigating grid integration challenges can be a significant barrier.
Political Opposition	Opposition from political actors, local authorities, or vested interests may hinder the development of energy cooperatives.
Community Engagement	Low levels of community interest and engagement can make it challenging to recruit members and gather support.
Complex Governance	Struggles in achieving consensus among cooperative members or managing the cooperative's governance can pose challenges.
Scaling Difficulties	Expanding operations or increasing the number of projects can be challenging, particularly for smaller cooperatives.
Market Volatility	Fluctuations in energy prices and market conditions can impact the financial stability of energy cooperatives.
Public Perception	Negative or misinformed public perceptions about renewable energy or cooperatives can create obstacles to community acceptance.
Legal Barriers	Legal restrictions, such as limitations on energy sales or cooperative formations, can be a significant impediment.

Source: own work on the basis of [71–83].

Energy cooperatives play a vital role in promoting sustainable, community-focused energy solutions that benefit both members and the environment. They empower local communities to take control of their energy needs, reduce costs, and contribute to a cleaner, more resilient energy future. Table 2 shows the main advantages of energy cooperatives' development [84].

Table 2. The advantages of energy cooperatives.

Advantages	Description
Local Energy Independence	Energy cooperatives promote local energy generation, reducing dependence on centralized utilities and imported energy.
Community Empowerment	Members have a say in decision making, fostering a sense of ownership and control over energy resources.
Support for Renewable Energy	Cooperatives often prioritize clean, renewable energy sources, contributing to environmental sustainability.
Economic Benefits	Profits and savings from energy projects benefit local communities, stimulating economic growth and job creation.
Reduced Energy Costs	Members can access affordable energy, especially through bulk purchasing and efficient energy generation practices.
Resilience to Power Outages	Energy cooperatives with microgrids enhance community resilience by providing a backup power source during emergencies.
Promotion of Energy Efficiency	Cooperatives often educate members about energy efficiency, leading to reduced energy consumption and lower bills.
Environmental Impact	The use of renewable energy sources reduces greenhouse gas emissions, contributing to climate change mitigation.
Democratic Decision Making	Cooperative members participate in governance, ensuring decisions align with community values and interests.

Table 2. *Cont.*

Advantages	Description
Community Development	Energy cooperatives invest in local infrastructure and community projects, strengthening the local economy.
Innovation and Technology Adoption	Cooperatives drive innovation in energy technologies and practices, benefiting both members and the broader community.
Advocacy for Favorable Policies	Cooperatives advocate for policies that support renewable energy and cooperative development, benefiting the industry.
Education and Awareness	Cooperatives raise awareness about sustainable energy practices, fostering a culture of environmental responsibility.

Source: own work on the basis of [77–88].

The development of energy cooperatives in the European Union (EU) countries is gaining momentum as a means to achieve energy sustainability, decentralization, and community engagement. Energy cooperatives, often referred to as "energy communities" in EU policies, are becoming increasingly important in the European energy landscape. The European Union has recognized the role of energy cooperatives in achieving its energy and climate goals [89,90]. EU directives and initiatives, such as the Clean Energy for All Europeans package, provide a supportive framework for the development of energy communities. These policies emphasize renewable energy, energy efficiency, and citizen participation [91]. Energy cooperatives in EU countries are pivotal in the transition to renewable energy sources. They often invest in and operate renewable energy projects, such as wind farms, solar installations, and bioenergy facilities, contributing significantly to the EU's renewable energy capacity [92,93]. The democratic governance structure of energy cooperatives aligns with EU principles of citizen participation and empowerment. Members have a say in decision-making processes, which fosters a sense of ownership and responsibility [94].

Energy cooperatives prioritize local ownership and control over energy resources. EU member states encourage community involvement by offering incentives, subsidies, and preferential tariffs for locally produced and consumed energy [95]. EU countries recognize the importance of energy resilience and security. Energy cooperatives, especially those with microgrids, enhance the resilience of local communities by providing a decentralized and reliable energy supply. Cooperatives in EU countries actively promote energy efficiency practices. They educate their members on energy-saving measures and implement energy-efficient technologies, contributing to the EU's energy efficiency targets [96].

Some energy cooperatives collaborate across borders, facilitating energy trading and sharing between EU countries. This cross-border cooperation aligns with the EU's vision of an interconnected European energy market. Energy cooperatives contribute to local economic development by reinvesting profits in the community, supporting jobs, and financing local projects. These benefits align with the EU's focus on regional development [97]. The use of renewable energy sources by energy cooperatives contributes to the EU's environmental sustainability goals, including reducing greenhouse gas emissions and mitigating climate change. Energy cooperatives in EU countries often engage in advocacy efforts to shape favorable policies and regulations. They collaborate with governments and other stakeholders to promote the interests of energy communities [98].

3. Materials and Methods

The article is based on a case study method. In the realm of scientific inquiry, one of the pivotal functions is explication, an endeavor that entails the pursuit of uncovering relationships and regularities. This pursuit facilitates a more comprehensive elucidation of the phenomena under scrutiny. In this context, the deployment of qualitative research methodologies emerges as a pertinent strategy. The primary objective the authors pursued was the acquisition of a profound understanding of the operational dynamics of an energy

cooperative, a phenomenon still relatively nascent in the Polish context. The essence of the problem was to be unearthed through this endeavor.

Qualitative methodologies offer the distinct advantage of enabling observation of the reality specific to the entity under examination, capturing the contextual milieu within which the relationships of interest transpire. This approach facilitates a nuanced, multifaceted analysis of the amassed data. Among the spectrum of qualitative methods suitable for fostering the advancement of scientific theories, the authors elected to employ the case study approach. This method, rooted in the pedagogical practices of Harvard Business School, is predicated on the analysis and discussion of real-life situations. Its application extends beyond the educational domain, finding relevance in the business sphere and various social sciences, including sociology, psychology, and economics. A notable merit of the case study methodology, particularly in the context of theoretical development, lies in its capacity to amass a wealth of detailed information pertaining to intricate relationships. This, in turn, aids in comprehending, articulating, and elucidating previously unexplored or poorly understood problems.

The researchers, upon contemplation, adjudged this methodological approach as befitting the cognitive objectives aimed at augmenting the corpus of knowledge regarding the operation of energy cooperatives in Poland. The case study method provided an avenue to capture experiences and interactions within their authentic context, duly considering the distinctiveness of the subject under study [99].

Predominantly, case study research is characterized by purposive sampling, a technique that, while nonrepresentative and rooted in subjective judgment, serves specific investigative purposes. The absence of representativeness precludes the possibility of hypothesis testing. In this scenario, the utility of the selected case for explicating the phenomenon under study forms the cornerstone of the subjective assessment criterion. An initial reconnaissance of the research subject, the "Our Energy" energy cooperative, led the authors to surmise that this entity would yield the requisite information. The choice of the research subject was influenced not only by substantive criteria but also by factors such as the cooperative's location and the proprietors' receptiveness to participating in the study.

Mindful of the limitations inherent to the case study method—namely, the restricted generalizability of findings, inherent subjectivity, replication challenges, and the risk of overinterpretation—the authors directed their focus toward the method's strengths. Case studies facilitate an intricate analysis of individual or multiple cases, yielding a rich and in-depth comprehension of specific situations, processes, and dynamics within organizations. Moreover, they enable the examination of phenomena in their genuine, real-world contexts, an aspect particularly invaluable when dealing with phenomena too complex for conventional research methods like surveys or experiments. Case studies are instrumental in generating new theories and hypotheses, which can subsequently be validated using other methodologies, including quantitative approaches. The conclusions derived from case study research are inherently idiographic, treating each case as unique and analyzing it within its specific context. This approach diverges from using cases to formulate generic conclusions or to corroborate pre-existing theories. The findings garnered facilitate an understanding of the unique attributes of the case under study, invaluable in formulating tailored management strategies. The case study method is also marked by its methodological flexibility, incorporating diverse data collection techniques such as in-depth interviews, participant observation, and document analysis [100].

In their methodological procedure, the authors took meticulous steps to minimize potential errors. These steps included the following:

1. Ensuring proper preparation of the researchers, encompassing both substantive expertise and specific skills vital for executing the planned activities. These skills involve the aptitude for posing pertinent questions, interpreting responses accurately, adept listening, and unbiased information reception, along with flexibility and responsiveness to evolving needs and a thorough understanding of the institution under study.

2. Exercising due diligence in the study's design phase, including the judicious selection of the study's subject and object scope aligned with the research objectives, as well as the careful choice of research tools and methods, thereby enhancing the credibility of the information obtained.
3. Engaging in continuous cross-examination of the research outcomes at each stage of the process, involving both the research team members and external, uninvolved parties, including representatives from the studied entity.
4. Developing proposals for quantitative research based on the insights gleaned from the case study with the aim of achieving more representative data in future investigations and subjecting the formulated concepts to further empirical scrutiny.

In the present study, a qualitative approach was employed to collect data regarding the operations of the energy cooperative "Our Energy". Data were gathered using the method of in-depth interviews, utilizing a set of thematic threads. The interviews addressed the following issues:

The genesis of the energy cooperative's establishment;

- The organization of the energy cooperative, its structure, and employment;
- Energy sources and technologies utilized;
- Services offered by the energy cooperative;
- Benefits and costs of joining the energy cooperative;
- Criteria for admission to the energy cooperative;
- The cooperative's collaboration with other institutions, organizations, and cooperatives;
- Future development plans.

Data were also gathered concerning the strengths and weaknesses, as well as opportunities and threats, of the energy cooperative "Our Energy" for the purpose of conducting a SWOT analysis. SWOT analysis (strengths, weaknesses, opportunities, threats), also known as the analysis of strengths and weaknesses in the context of opportunities and threats posed by the environment, is a strategic tool used to assess the competitive position of an institution or a company. It involves identifying key factors determining the entity's competitive strength and evaluating them using a specific set of criteria and rating scales. SWOT analysis is one of the possible strategic analyses that can be applied. Other analyses that exist in theory and business practice include, among others: PESTEL analysis (political, economic, social, technological, environmental, legal)—assessing the impact of the macro-environment on the organization; Porter's five forces analysis—focusing on industry competitiveness and the market position of the company; value chain analysis—identifying internal company activities that create value for the customer; and BCG matrix (Boston Consulting Group)—analyzing the company's product portfolio based on market growth and market share. Considering the limitations of SWOT analysis, the authors chose this method due to its simplicity and universality, ease of understanding, versatility, and the possibility of application in various contexts and different types of organizations. Moreover, SWOT analysis helps to identify key factors influencing success and facilitates the creation of strategic plans by identifying areas for development and potential threats [101]. The starting point of the analysis involves answering the following questions: what are the strengths and weaknesses of the institution, what threats must it consider, and what opportunities can it leverage?

The cooperative's strengths primarily lie in its unique resources and other aspects that positively distinguish it from other energy cooperatives. The weaknesses of the cooperative are all aspects of its functioning that limit its efficiency or hinder its development. There is no universal definition for strengths and weaknesses. They should be defined situationally for the use of a given energy cooperative. In searching for opportunities and threats in the environment of the energy cooperative, the following questions should be addressed: what significant events for the cooperative occur or may occur in the environment and how might they affect the cooperative's performance; which of these events can have a beneficial

or adverse impact on the future development of the cooperative, what opportunities do they present, and what threats do they carry?

In our case study, the benefits of belonging to a cooperative are embedded in energy balancing. At the current stage of development, the cooperative does not have its own energy commingling storage. An investment is planned for the next few years in a project called intelligent energy commingling storage for the Our Energy cooperative. In addition, a computerized billing system is being set up for the cooperative to account for energy generated from PV installations and transferred to the grid, as well as energy taken from the grid by cooperative members. Currently, all members of the cooperative have their own PV installations; there are no houses in the cooperative that do not have such an installation, but in the future, there will be such houses, because the energy surplus must be rationally managed. The cooperative benefits from a lower price for energy drawn from the grid when surplus energy generated from RESs is surrendered.

The in-depth interview and workshop focusing on elements of the SWOT analysis took place with the participation of board members of the "Our Energy" cooperative in October 2023 at the cooperative's location in Mszana, Silesian Voivodeship. The aim of the SWOT analysis was to determine the competitive position of the EC "Our Energy", gather materials to facilitate future decision-making processes (in the context of the development of the EC "Our Energy"), indicate directions for optimizing resources, and identify market opportunities and areas for improvement.

4. Results of the Analysis

4.1. Creation and Development of Energy Cooperative "Our Energy"

The energy cooperative is a cooperative in the sense of the Act of 16 September 1982—Cooperative Law—or the Act of 4 October 2019 on farmers' cooperatives [60]. The impetus for establishing the cooperative was a law that created conditions for combining the forces of electricity producers and prosumers. For both groups, the motive for action was the possibility of reducing energy costs. Prosumers associated with the cooperative do not have to give away 20% of the energy they produce, unlike unaffiliated prosumers. Moreover, the law allowed prosumers to bypass distribution fees, which in itself reduces the costs associated with energy consumption. Additionally, the law offered opportunities for balancing energy production and distribution to entities that form a cooperative. The idea was implemented by three people who established the cooperative, fulfilling the formal requirements (filling out an application and submitting it to the National Court Register (KRS)). These three people had experience in the RES market and were eager to work toward the development of this market in Poland, as they had business contacts and good relations with the local community. Organizing the venture was a pro publico bono activity for these individuals. The initial capital of the cooperative was PLN 1000. Eleven individuals joined the cooperative. After fulfilling the formal requirements and registering in the KRS, an information and promotional campaign was launched among the residents of three municipalities in the Silesian Voivodeship: Mszana, Godów, and Świerklany. Residents and entities of the Mszana and Godów municipalities showed great interest in the idea of the energy cooperative (Figure 1). In contrast, in the Świerklany municipality, there were no volunteers to engage in the initiative, fearing such a new and unknown venture.

In practice, the role of local governments in establishing and developing energy cooperatives in their territory is reduced to four types of activities [102]:

1. Mobilizing and associating the local community by encouraging and enabling joint actions, including investments in the development of RESs through energy cooperatives;
2. Providing information, training, and advice on legal regulations, financing programs, and possible legal forms of energy communities, including energy cooperatives;
3. Personal and organizational support in establishing energy cooperatives;
4. Membership of the municipality in the energy cooperative.

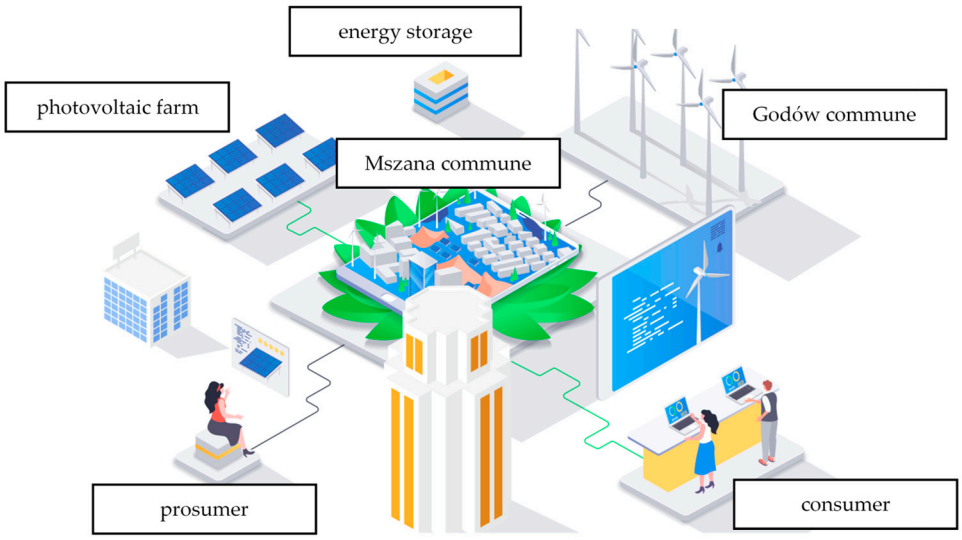

Figure 1. The concept of operation of an energy cooperative. Source: [22].

Moreover, the law and policy of the European Union, in particular with regard to the RED II Directive, repeatedly emphasizes the active and activating role of local governments [103]. Energy cooperatives developed with the participation of local governments can be an instrument to combat energy poverty. This will require the introduction of incentives and legal frameworks that encourage the energy poor to join cooperatives. These should be financial programs that make participation in the cooperative inclusive. For many energy cooperatives in Belgium, Germany, and the Netherlands, the fight against energy poverty is an important motivation to act [104]. The European Economic and Social Committee on Prosumer Energy and Prosumer Power Cooperatives, highlighting the opportunities and challenges in EU member states, points out that in Germany, for example, municipalities are very important partners of energy cooperatives, not only as they make roofs and municipal buildings available for investment but also as the mayor himself will often takes the initiative to set up an energy cooperative and try to persuade the inhabitants of the merits of the idea. It is also noted that even partial transfer of energy systems to local authorities is taking place through recommunalization, decentralization of services, and participatory management in the form of partnerships or certified energy cooperatives, strengthening citizens' initiatives in the field of energy. The energy cooperative aims to gain local benefits and is able to provide services in the energy sector, such as the generation of individual or external renewable energy for personal consumption and sale, the ownership and operation of small grid storage systems and distribution infrastructure, and the implementation of energy efficiency measures [105]. The idea of the energy communities is based on a strong connection and cooperation of residents with the municipality (city and municipality institutions), because residents joining cooperatives need approval for their activities from the local government who, for example, can give them (or lease) an area for photovoltaic screens if they do not have space in their home [106].

The energy cooperative "Our Energy" is an example of an innovative response to the changing regulatory and market conditions in the energy sector. The main tasks of the "Our Energy" energy cooperative include generating energy from renewable sources, grouping producers and consumers of energy from RESs (renewable energy sources), and striving to reduce emissions in the areas of cooperative operation (currently three municipalities: Mszana, Godów, and Świerklany).

Currently, the energy cooperative has 13 members, including 11 individuals, 1 enterprise, and 1 municipality. The members are divided across the municipalities as follows: Świerklany, one member; Godów, five members, including one person with two installations; and Mszana, eight members. The municipality, as a member of the energy cooperative, at the current stage of activity, is a passive member, as it is obliged to meet deadlines for the

supply of energy to buildings belonging to the municipalities, including the school of the city office, under commercial agreements with the current energy suppliers. The contracts will expire in a few months and then it will be able to designate municipal buildings for direct energy billing within the energy cooperative. In turn, the company that is a member of the cooperative is a car repair shop employing 10 people. There are also 11 detached houses from the 1990s and newer in the cooperative. The members of the cooperative are obliged to attend a general meeting once a year. The cooperative employs two people who act as president and deputy (these persons are also members of the cooperative, and their houses are in the cooperative). In addition, there is a three-member supervisory board with a term of 4 years. Every member of the cooperative has access to information about the cooperative by phone, email, and via the cooperative's website.

The cooperative's board operates on a voluntary basis. The surplus balance generated is distributed among the members. The energy cooperative specializes in sharing the produced energy and minimizing costs for its members through direct energy trading with the municipality. The cooperative utilizes photovoltaic panels with a capacity of 112 KW, which is currently its only energy source.

The benefits of belonging to a cooperative are included in energy balancing. At the current stage of development, the cooperative does not have its own energy compaction storage. The investment is planned for the coming years—a project called intelligent energy compaction storage for the Our Energy cooperative. In addition, a computerized system accounting for the energy generated from PV installations and transmitted to the grid, as well as the energy taken from the grid by the members of the cooperative, is being created for the needs of the cooperative. At present, all members of the cooperative have their own PV installations; there are no houses in the cooperative that do not have such installations, but in the future, there will be such houses, because surplus energy must be rationally managed.

The cooperative offers services in energy production, obtaining funding for PV installations.

Investing in photovoltaics as part of an energy cooperative may be more profitable than a home PV installation for several reasons [107]:

1. Project Scale: The energy cooperative can implement a larger photovoltaic project, which involves installations on more buildings or leased land from the municipality. As a result, economies of scale can be exploited, which leads to a reduction in the cost of purchasing and installing photovoltaic panels and other equipment.
2. Space Efficiency: Home PV installations often have space constraints, such as small roofs or small areas available for panel mounting. The energy cooperative may locate the panels on a larger area, for example, on the roofs of larger buildings in a community or adjacent areas. More panels mean more electricity production, which translates into greater savings.
3. Distribution and Management: The energy cooperative can benefit from more advanced technologies and tools to monitor, manage, and distribute electricity. This makes it possible to optimally use the energy produced by photovoltaic panels within the cooperative. The ability to sell surplus energy to the grid may also generate additional revenue.
4. Maintenance and Service Costs: For the energy cooperative, the maintenance and service costs of the photovoltaic system may be spread over a larger number of users. Joint operation and maintenance of the system can be more efficient and cost-effective than individual management of the installation by the owners of home photovoltaic systems.
5. Access to Finance: An energy cooperative may be more likely to obtain favorable financing terms, such as lower interest rates on loans or access to grants and support schemes. This can help to reduce the cost of investment in photovoltaics.

Of course, the profitability of PV investments within an energy cooperative will depend on many factors, such as purchase and installation costs, electricity prices, availability

of financing, and local energy regulations and regulations. Before making an investment decision, it is always worthwhile to carry out a cost–benefit analysis, taking into account individual conditions and needs [108].

Benefits for the members of the energy cooperative include stable energy prices, the possibility of recovering up to 100% of the produced energy (1/1 settlement rate), and a stable source of electricity supply from the energy cooperative. Membership in the energy cooperative also brings benefits such as cocreating the energy potential of the region, developing local projects supporting entrepreneurs and farmers based on clean and renewable energy, and creating a locally economically active community. Membership in the energy cooperative is also associated with securing stable future income from profit sharing, which is decided by the cooperatives' members. Joining the energy cooperative involves an entry fee of PLN 1500, and the cost of one share amounts to PLN 50. Membership in the energy cooperative is limited to individuals from the three mentioned municipalities. Admission criteria depend on the needs of the energy cooperative (production, consumption, and prosumption) in the context of energy balancing

The energy cooperative actively cooperates with municipal offices and energy operators and plans to collaborate with other energy cooperatives. The energy cooperative has ambitious development plans. It aims to identify unused lands in the municipality and construct PV farms on them. It intends to build a new, larger headquarters and employ staff to manage the energy cooperative and its members. By 2025, it plans to build 220 PV installations and invest in the development of distributed energy. The vision for development also includes the virtualization of consumers, which will involve building a photovoltaic farm in location A and the possibility of using energy in location B, considering distribution fees. The ultimate goal is to achieve self-sufficiency and generate such a surplus balance that it will be possible to pay dividends to cooperative members and invest in development. Currently, the key task is purchasing software to monitor the production and consumption of energy of each member of the energy cooperative in real time, which will allow them to track investment opportunities in the cooperative's expansion in accordance with legislative requirements. The board also plans to introduce an innovation involving the use of structures under PV panels that reduce the carbon footprint. These are structures made of composites, which are easier to dispose of and can be used in other projects (e.g., in building bike paths).

There are barriers to the cooperative's development path. In reference to the development barriers to energy cooperatives presented in Table 1, actions undertaken by the energy cooperative "Our Energy" to overcome them can be identified. The cooperative actively seeks grants and government subsidies. Partnerships with local businesses and organizations can also contribute to the acquisition of additional funds. Overcoming legal barriers is somewhat more challenging. The cooperative works with lawyers specializing in energy law and with local and national authorities to change or mitigate regulations that limit the cooperative's activities. To reduce barriers related to securing land, the EC conducts talks with local authorities of neighboring municipalities to identify suitable land or use less traditional locations, such as building rooftops. The EC also closely cooperates with energy network operators, seeking technical support to facilitate integration with the existing energy infrastructure. A barrier to the development of energy cooperatives is the low interest of the community in such solutions. The EC "Our Energy" organizes local events, workshops, and information campaigns that emphasize the benefits of cooperating with the cooperative. In the context of increasing knowledge about the effective operation of cooperatives in Polish conditions, the EC "Our Energy" closely cooperates with academic experts from the Silesian University of Technology in Gliwice and the University of Economics in Katowice. The key to success is flexibility, innovation, and the ability to adapt to changing market and regulatory conditions. It is also important to have the engagement and cooperation of all cooperative members to collectively strive for the realization of set goals.

4.2. Strengths and Weaknesses of the "Our Energy" Energy Cooperative in the Context of Opportunities and Threats in Its Environment

Analyses of the strengths and weaknesses of the energy cooperative "Our Energy" against the opportunities and threats of the environment in which it operates were conducted in the context of achieving the strategic goals set for 2026. The identification of strengths and weaknesses, opportunities and threats, as well as strategic goals was carried out by the members of the board of the "Our Energy" energy cooperative. The board members also assessed the impact of strengths and weaknesses, as well as opportunities and threats, on the achievement of strategic goals on a scale of 1 to 5 (where 1 means no impact, and 5 means a very strong impact).

The following goals were set with a perspective for achievement by 2026:

- C1. Increase the number of members of the energy cooperative by 220;
- C2. Construct 220 photovoltaic installations with energy storage and energy management systems;
- C3. Cover the entire energy cooperative with a balancing system using information technology;
- C4. Eliminate energy poverty in the area of the energy cooperative's operation;
- C5. Reduce emissions in the area of the energy cooperative's operation.

The strengths and weaknesses of the "Our Energy" energy cooperative along with the average score for achieving goals C1, C2, C3, C4, and C5 are presented in Table 3, while the opportunities and threats are shown in Table 4.

Table 3. Strengths and weaknesses of the "Our Energy" energy cooperative.

Strengths	**Average Rating ***
S1. Lower energy costs for members	4.67
S2. Openness of the cooperative and its members to development and innovation	4.27
S3. Energy balancing among cooperative members	4.27
S4. Energy security resulting from signed contracts for energy distribution and sales	3.47
S5. Democratic procedures of cooperative management	2.60
Weaknesses	**Average Rating ***
W1. Insufficient individual financial resources for investment in renewable energy sources (RES)	5.00
W2. Lack of a real-time energy distribution monitoring system	4.07
W3. Insufficient human and local resources	3.47
W4. Undiagnosed technical possibilities for connection to the power grid	3.47
W5. Small number of cooperative members	1.80

Source: own research. S—strengths, W—weaknesses. * A rating scale from 1 to 5, where 1 means no impact, and 5 means a very strong impact.

Table 4. Opportunities and threats of the "Our Energy" energy cooperative.

Opportunities	**Average Rating ***
O1. Access to funding from national and European Union sources	5.00
O2. Increased public awareness in the field of renewable energy sources (RESs)	4.27
O3. Increase in energy poverty due to rising electricity prices	4.20
O4. Emergence of new techniques in energy production and storage	3.87
O5. Introduction of climate policy	3.40
Threats	**Average Rating ***
T1. Negative associations of residents with the cooperative form due to experiences from the previous regime	4.27
T2. Instability of legal regulations	4.20
T3. Society's reluctance to engage in projects related to renewable energy sources (RESs)	4.40
T4. Limitations imposed by the power system operator (OSD) regarding the connection of installations	4.20
T5. Dependence on dominant organizations in the electricity distribution market	3.40

Source: own research. O—opportunities, T—threats. * A rating scale from 1 to 5, where 1 means no impact, and 5 means a very strong impact.

Based on the ratings given by workshop participants, average impact scores were calculated. The strongest positive impacts on the achievement of strategic goals include such strengths as lower energy costs for members of the energy cooperative, the openness of the energy cooperative and its members to development and innovation, and energy balancing among cooperative members. On the other hand, the most significant negative impacts on the achievement of strategic goals include such weaknesses as insufficient individual financial resources for investment in RESs and the lack of a real-time energy distribution monitoring system.

In the analysis of the strengths and weaknesses of the "Our Energy" energy cooperative against the background of opportunities and threats in the environment, in the context of achieving the strategic goals set for 2026, the sum of ratings made by the board members was also used (on a scale from 1 to 5, where 1 means no impact, and 5 means a very strong impact) (Table 5).

Table 5. Analysis of the impact of strengths and weaknesses, as well as opportunities and threats, on the achievement of strategic goals of the "Our Energy" energy cooperative.

	C1	**C2**	**C3**	**C4**	**C5**	∑
S1	15	11	10	14	14	64
S2	14	15	12	13	10	64
S3	15	15	14	15	11	70
S4	14	8	5	8	4	39
S5	15	13	8	10	6	52
∑	73	62	49	60	45	289
W1	3	3	4	10	7	27
W2	15	15	14	8	9	61
W3	14	14	8	8	8	52
W4	14	13	7	9	9	52
W5	15	15	15	15	15	75
∑	61	60	48	50	48	267
O1	15	15	15	15	15	75
O2	14	14	10	12	14	64
O3	12	14	14	8	10	58
O4	10	11	8	8	14	51
O5	15	14	7	15	12	63
∑	66	68	54	58	65	311
T1	15	15	7	11	15	63
T2	15	15	10	12	14	66
T3	15	15	6	14	14	64
T4	11	10	8	10	12	51
T5	15	15	4	14	15	63
∑	71	70	35	61	70	307

Source: own research. S—strengths, W—weaknesses, O—opportunities, T—threats.

From the conducted analysis, it appears that the strengths and opportunities emerging in the environment of the energy cooperative outweigh the weaknesses and threats, although the difference in the total points is not large compared to the sum of strengths and threats (Figure 2).

The "Our Energy" energy cooperative should focus on intensive development by combining its strengths with favorable conditions in the rapidly changing environment while closely observing and attempting to avoid threats. Based on the analysis conducted, it was determined that the adopted strategic (developmental) goals C1, C2, C3, C4, and C5 are achievable within the planned period of the next three years. The assessment confirmed that these goals can be classified as strategic, and their realization will contribute to the further development of the "Our Energy" energy cooperative.

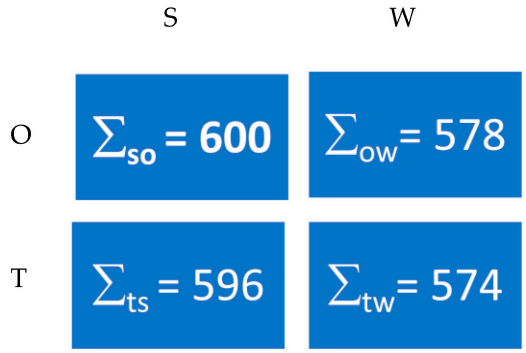

Figure 2. Analysis of the impact of strengths and weaknesses, as well as opportunities and threats, on the achievement of strategic goals of the "Our Energy" energy cooperative. Source: own research.

5. Discussion

In the paper, we have observed the development of an energy cooperative community in Poland using the example of the "Our Energy" energy cooperative. This cooperative was founded in response to regulatory changes in the energy sector, driven by the desire to unite producers and consumers of electricity. This collaboration aimed to reduce energy costs for both groups, with cooperative members exempt from the mandatory 20% energy return required by nonmember consumers. Additionally, members could bypass distribution fees, contributing to overall cost reduction.

Initiated by three experienced individuals in the renewable energy sector, the cooperative aimed to benefit the local community. The cooperative's initial capital was modest, with 11 individuals joining after fulfilling formal requirements. An informative campaign was launched in three municipalities, garnering significant interest.

The same aims of the energy cooperative have been observed in other EU research. For example, Vernay et al. [109] observed that it is important to implement policy instruments to facilitate larger-scale projects and diverse technologies, possibly through a publicly guaranteed fund for financing the risky development phase. Also, they think that energy cooperatives should recognize the importance of intermediary actors, such as energy cooperative federations and local energy agencies, in standardizing processes, providing local support, increasing legitimacy, and facilitating networking.

"Our Energy" currently boasts 13 members, including individuals, a business entity, and a municipality. The cooperative operates on voluntary principles, and any surplus is distributed among members. It specializes in sharing produced energy and minimizing costs through direct energy exchange with the municipality. The cooperative relies on a 112 KW photovoltaic system as its sole energy source.

The resource-based view theory [110] suggests that sustainable competitive advantage is achieved through the possession of valuable, rare, and difficult-to-imitate resources [111,112]. In the case of the energy cooperative "Our Energy", the lower energy costs for members, open management practices, and the ability to balance energy production and consumption can be considered valuable resources [112,113]. These factors contribute to the cooperative's competitive advantage in the local energy market.

Services offered include energy production, acquiring subsidies for PV installations, and PV installation for subsidized entities. Membership benefits encompass stable energy prices, the potential to recover 100% of generated energy (1/1 settlement ratio), and a secure source of electricity from the cooperative.

Despite the success, challenges include financial constraints for renewable energy investments and the lack of real-time energy distribution monitoring. The cooperative actively collaborates with local authorities and energy operators and plans to engage with other energy cooperatives. Ambitious development plans involve identifying unused areas for PV farms, constructing a larger headquarters, and hiring staff.

The importance of energy cooperative collaboration with local communities was also described by Schmid et al. [96]. According to them, the roles of local governments and

their responses to community energy initiatives are very important. Instead of viewing energy cooperative initiatives as exceptions, they should be recognized as opportunities for cocreating new formal arrangements that serve the public interest. The challenge lies in finding a balance between enabling and authoritative modes of governing. Enabling involves engaging with and creating space for private and community actors, while authoritative modes focus on preserving the public interest. This balance is crucial as energy cooperatives are primarily accountable for their members, not the entire citizenry.

The degree of proximity between local government and energy collaboratives can be examined in terms of its impact on the success of the latter. The results are ambiguous, with some studies suggesting that close interaction and high trust are preconditions for success [96,114], while others highlight cases where community energy organizations deliberately refrain from involving public authorities [115,116]. The role of local governments in supporting cooperatives is crucial, and too pro-active a role could potentially produce dependency relations and hinder civil society activism.

The cooperative's active collaboration with local authorities and energy operators corresponds with stakeholder theory [117]. By engaging with various stakeholders, including government entities, the cooperative strengthens its position and contributes to the broader societal goals of energy transition and sustainable development [118]. The benefits offered to cooperative members, such as stable energy prices, full utilization of produced energy, and participation in profit-sharing, align with stakeholder theory by ensuring that members, as primary stakeholders, share in the success and benefits of the cooperative [119].

The focus on renewable energy production through photovoltaic systems aligns with the principles of sustainable development [120,121]. The cooperative's commitment to reducing emissions and offering stable [122], locally sourced energy contributes to the broader discourse on environmentally friendly and sustainable energy practices [123]. The cooperative's engagement with local communities and plans for future development, such as building solar farms on unused land, reflects a commitment to sustainable community development [124]. The emphasis on local projects supporting entrepreneurs and farmers aligns with the idea of sustainable and inclusive growth [125].

The cooperative aims to build 220 PV installations by 2025, invest in distributed energy development, and achieve self-sufficiency. Software for real-time energy monitoring is crucial, and innovations such as PV panel structures to reduce the cooperative's carbon footprint are being considered.

The SWOT analysis identifies key strengths, weaknesses, opportunities, and threats [126,127]. Strengths include lower energy costs, openness to innovation, and democratic management procedures. Weaknesses include insufficient funds for renewable energy investment and a lack of real-time energy distribution monitoring.

Opportunities include access to funding from national and EU sources, increasing public awareness of renewable energy, and the growth of energy poverty due to rising electricity prices. Threats involve negative perceptions of cooperative forms, legal instability, societal reluctance toward renewable projects, restrictions on installations, and dependence on dominant energy distribution organizations [128,129].

The analyzed cooperative demonstrates strengths aligned with cooperative theory [130,131], such as lower energy costs for members, democratic governance [132], and an openness to innovation [133]. These align with the principles of cooperatives [134], emphasizing member benefits, democratic decision making, and community engagement. The low number of cooperative members is highlighted as a weakness. This also corresponds with cooperative theory [135,136], which emphasizes the strength of cooperatives in numbers. Limited membership may impact the cooperative's ability to leverage collective bargaining power fully.

Strategic goals (C1–C5) include expanding membership, building PV installations, implementing energy balancing, eradicating energy poverty, and reducing emissions. Strengths and opportunities, such as lower energy costs and access to funding, align

favorably with these goals. Addressing weaknesses, like financial constraints, will be crucial for success.

In the following part of the paper, we try to prepare an extensive discussion of relations between the strengths and weaknesses of the analyzed energy community and its strategic goals.

Lower energy costs for members (S1): This strength is rated very high (4.67) and has a significant positive impact on achieving the strategic goals. Lower energy costs directly contribute to Goal C1 (Increase the number of members) by making the cooperative more attractive to potential members. It also supports Goal C4 (Elimination of energy poverty) by providing affordable energy to a larger section of the community.

Openness of the cooperative and its members to development and innovation (S2): With a high rating of 4.27, this strength positively influences the achievement of all strategic goals. Openness to innovation (S2) aligns with Goal C2 (Construction of photovoltaic installations), as innovation is often crucial in renewable energy projects. Additionally, an innovative approach can contribute to Goal C5 (Reduction in emissions).

Energy balancing among cooperative members (S3): This strength, rated 4.27, is particularly impactful on Goal C3 (Covering the entire energy cooperative with a balancing system). Energy balancing is essential for the efficient functioning of a cooperative with multiple producers and consumers. It ensures stability in energy distribution and supports the integration of renewable energy sources.

Insufficient individual financial resources for investment in renewable energy sources (RES) (W1): This weakness is rated the highest (5.00) among all, indicating a critical challenge. Its significant negative impact is reflected in lower ratings across all strategic goals (C1–C5). A lack of financial resources hampers the cooperative's ability to invest in new photovoltaic installations (C2), implement energy balancing systems (C3), and eliminate energy poverty (C4).

Lack of a real-time energy distribution monitoring system (W2): Rated 1.80, this weakness has a considerable negative impact on Goal C3 (Covering the entire energy cooperative with a balancing system using information technology). Real-time monitoring is crucial for efficient energy balancing, and its absence can hinder the cooperative's progress in this aspect.

Insufficient human and local resources (W3): With a rating of 4.07, this weakness affects various strategic goals. It particularly impacts Goal C2 (Construction of photovoltaic installations), as the lack of local resources might hinder the timely execution of projects.

The strengths and weaknesses that have a greater impact on the strategic goals of the energy cooperative are those directly related to the affordability and accessibility of renewable energy, openness to innovation, and the ability to invest in new projects. Conversely, weaknesses such as financial constraints and the absence of monitoring systems present significant hurdles in achieving the outlined strategic goals. Addressing these weaknesses is crucial for the sustainable development of the energy cooperative.

This concept aligns with theories of technological innovation and smart grid development, showcasing the cooperative's forward-thinking approach to energy distribution.

Energy cooperatives, such as "Our Energy", play a crucial role in promoting the production of energy from renewable sources. By focusing on solar (photovoltaic) installations and other renewable technologies, these cooperatives contribute to the reduction in greenhouse gas emissions associated with traditional energy sources.

As the cooperative continues its journey, addressing financial constraints, embracing technological advancements, and fostering community engagement will be key. "Our Energy" has not only illuminated a path to sustainable energy but has also become a beacon for community-driven change in the dynamic landscape of renewable energy [137].

The cooperative model involves local communities in the generation and consumption of renewable energy. This not only creates a more resilient and sustainable energy system but also fosters a sense of ownership and responsibility among community members.

Engaging local communities is essential for achieving widespread acceptance and support for renewable energy initiatives [33].

Successful energy cooperatives can influence energy policies and regulations at local and national levels. Their experiences and successes can serve as examples for policymakers, demonstrating the feasibility and benefits of decentralized, community-driven energy initiatives. This, in turn, can lead to the development of more favorable policies for renewable energy and sustainability [138].

It can be stated that the findings of this paper, although focused on one energy community in one country, offer a rich source of insights, strategies, and considerations that can be adapted and applied to diverse contexts seeking to establish, manage, and sustain community-driven renewable energy initiatives.

The success and challenges outlined in this paper provide a valuable model for the establishment and management of community-driven energy cooperatives. Other communities, regions, or countries (especially those similar to Poland, where energy communities are not widespread) aiming to promote renewable energy and community engagement can draw insights from the experiences of "Our Energy". The cooperative's approach to uniting producers and consumers, lowering energy costs, and fostering sustainability can be adapted to various settings. The strategic goals outlined in the paper (C1–C5) can serve as a blueprint for other energy cooperatives aspiring to make a substantial impact on their local energy landscapes. The methodology used to identify, evaluate, and set strategic goals provides a systematic approach that can be replicated in different contexts.

The SWOT analysis conducted in the paper offers a comprehensive evaluation of internal strengths and weaknesses, coupled with external opportunities and threats. This analytical framework is transferable to other renewable energy initiatives. Stakeholders and policymakers in various regions can employ SWOT analyses to assess the feasibility and potential challenges of community-driven energy projects.

The paper emphasizes the significance of engaging with various stakeholders, including local authorities, energy operators, and community members. This approach can be transposed to different contexts, where collaboration with diverse stakeholders is crucial for the success and sustainability of renewable energy initiatives. The identified weakness of "Insufficient individual financial resources for investment in renewable energy sources (RESs)" highlights a common challenge faced by energy cooperatives. Strategies employed by "Our Energy" to overcome financial limitations, such as seeking funding from national and EU sources, can serve as a guide for other cooperatives navigating similar constraints.

The cooperative's emphasis on innovation and openness to new technologies is a transferable lesson for other initiatives. Encouraging a culture of innovation and exploring emerging technologies can enhance the efficiency and competitiveness of community-driven renewable energy projects.

The paper suggests that undertaking long-term studies on the sustainability and resilience of energy cooperatives would provide a deeper understanding of their ability to adapt to changing circumstances. This long-term sustainability focus goes beyond a snapshot analysis, acknowledging the evolving nature of energy cooperatives and their role in the EU's decarbonization goals.

6. Conclusions

The cooperative, with a humble initial capital of PLN 1000, has grown to include 13 members, spanning individuals, businesses, and a municipality. Operating on voluntary principles, "Our Energy" leverages a 112 KW photovoltaic system, distinguishing itself as a pioneer in clean energy within the region.

Members benefit from stable energy prices, full recovery of produced energy, and a reliable source of electricity directly from the cooperative. The success is underlined by the cooperative's specialization in energy sharing, a practice that minimizes costs for its members through direct energy transactions with the local municipality.

The SWOT analysis underscores several key factors. Strengths, including lower energy costs and openness to innovation, align with opportunities such as access to funding and increasing public awareness of renewable energy. On the other hand, weaknesses, like financial constraints, and threats, including societal reluctance and legal instability, present challenges that require careful consideration.

The strategic goals outlined (C1–C5)—expanding membership, building PV installations, implementing energy balancing, eradicating energy poverty, and reducing emissions—represent a bold vision for the cooperative's future. The analysis suggests that these goals are within reach, given the cooperative's strengths and the opportunities present in the broader environment.

Challenges, particularly financial limitations for renewable energy investments and the absence of real-time energy distribution monitoring, highlight areas for improvement. As the cooperative looks to achieve its ambitious plans, addressing these challenges will be pivotal.

Innovations, such as the consideration of PV panel structures to reduce the carbon footprint and active engagement with local authorities and energy operators, showcase a forward-thinking approach. The commitment to real-time monitoring through the acquisition of monitoring software is a strategic move in line with future developments.

Looking ahead, "Our Energy" aims to build 220 PV installations by 2025, contribute to distributed energy development, and achieve self-sufficiency. The cooperative's vision extends beyond energy production, encompassing the creation of local projects that support entrepreneurs and farmers through clean and renewable energy.

It can be stated that "Our Energy" stands as a testament to the potential of community-driven energy cooperatives. Its ability to bridge the gap between producers and consumers, coupled with a commitment to sustainability and community welfare, positions it as a model for future energy initiatives.

The novelty of this paper lies in its detailed examination of a specific renewable energy cooperative, incorporating SWOT analysis, stakeholder perspectives, quantitative assessments, and a forward-thinking approach. This multifaceted analysis contributes to the existing literature on renewable energy initiatives, providing a valuable reference for researchers, policymakers, and practitioners in the field. While SWOT (strengths, weaknesses, opportunities, threats) analyses are common in business literature, applying this framework to renewable energy cooperatives is a distinctive feature of this paper. The SWOT analysis provides a systematic evaluation of internal and external factors affecting the cooperative, offering a structured and comprehensive assessment. The inclusion of board members in the identification and assessment of strengths, weaknesses, opportunities, and threats adds a novel stakeholder perspective. By involving key actors within the cooperative in the analysis, the paper captures diverse viewpoints, contributing to a more holistic understanding of the cooperative's strategic position. The paper goes beyond a technical examination of renewable energy production and consumption. It considers the cooperative's impact on the local community, highlighting its role in fostering sustainable development, community engagement, and overall well-being. This broader perspective adds depth to the understanding of the social dynamics of community-driven energy initiatives.

The main scientific value of this paper lies in its empirical examination of a real-world renewable energy cooperative, coupled with a methodologically sound analysis of its strengths, weaknesses, opportunities, and threats. The strategic goal formulation and evaluation, the integration of stakeholder perspectives, and the quantitative assessment enhance the broader understanding of community-driven renewable energy initiatives in the scientific community.

The main limitation of this work is that it lacks broader generalizability due to the small sample size of one energy cooperative. For a more comprehensive understanding of the impact of collaborative energies on decarbonization, studies encompassing a diverse range of cooperatives in various settings would be necessary.

In the future, undertaking long-term studies on the sustainability and resilience of energy cooperatives would provide a deeper understanding of their ability to adapt to changing circumstances and maintain their commitment to decarbonization goals. This could involve tracking the cooperatives' performance over several years and assessing their evolution in response to dynamic external factors. Also, in the future, it could be interesting to investigate the broader socio-economic impact of energy cooperatives on local communities. Research could delve into how these initiatives influence employment, community engagement, and overall well-being. Understanding the social dynamics and benefits generated at the local level would provide a more holistic perspective on the role of collaborative energies in fostering sustainable development.

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