ENERGY COMMUNITIES AS A MODERN ORGANIZATIONAL TOOL FOR REGIONAL OR LOCAL ENERGY PRODUCTION AND DISTRIBUTION IN SLOVAKIA

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Abstract

The paper describes the energy community (EC) in Slovakia from the perspective of their establishment and development with the aim of finding answers to crucial theses - defining a well-managed EC, possible involvement, motivation and determination of participants and at the same time the target group of initiative. It presents original solutions and a scheme of organizational structure for the successful conception and operation of the EC and how to correctly overcome challenges and barriers in the activity on the Slovak energy market with particular emphasis on the implementation of renewable energy sources (RES).

Keywords: *energy community, energy efficiency, operability, participant motivation, target group, organizational structure*

1 BACKROUND AND CONSIDERATIONS

1.1 Energy communities as producers and distributors of energy with a contribution from renewable sources

According to Directive 2018/2001 (Slovak Republic) on the promotion of the use of energy from renewable sources (RES), a renewable energy community is a legal entity [12, 13]:

a) which is established in accordance with the relevant national legislation based on open and voluntary participation, is independent and effectively controlled by shareholders or members located in the vicinity of renewable energy projects owned and developed by that legal entity;

b) whose shareholders or members are natural persons, SMEs or local authorities, including municipalities;

c) whose primary purpose is to provide environmental, economic or social benefits to its shareholders or members or to the local areas in which it operates, rather than to generate financial profit. According to the explanatory memorandum, Member States should ensure that renewable energy communities can participate in available support schemes under the same conditions as large players.

Enabling RES-based communities to operate in the energy system and facilitating their integration into the market is part of measures to compensate for the disadvantages associated to the specific characteristics of local renewable energy communities – such as their size, ownership structure and number of projects. Renewable energy communities should also be allowed to exchange energy produced in the installations they own with each other. [1, 2]

The concept of energy communities also offers a potentional solution to energy poverty, one of the most pressing issues of our time. According to a 2019 EU-wide survey, 6.9% of the EU population could not afford to heat their homes adequately. Especially in local areas, energy poverty is a serious problem that can be solved by exploiting the flexibility that energy communities offer to the electricity grid through demand response and energy storage, improve their energy efficiency and reduce energy bills. [3, 7, 12]

This contribution, which presents selected key findings from the research solution within the NRGCOM project DRP0200163 of the EU program: Interreg Danube Region Program, deals with key questions that can be formulated as follows:
1. How can a well-managed EC be defined?
2. How to design the most appropriate organizational structure for EC production and distribution?
3. How to successfully design and operate an EC?
4. How to involve participants - EC members in the activity and production?
5. How to correctly overcome problems, risks and obstacles?
6. How to identify and motivate the target group of EC consumers?

1.2 Defining a well-managed EC

An energy community (EC) implementing renewable energy is a legal entity established for the purpose of generating electricity and related activities to achieve environmental, economic or social benefits, with their primary purpose not being to make a profit, but to achieve sustainable and efficient energy production and consumption, reduce energy costs, improve air quality and reduce dependence on fossil fuels. [3, 7, 11] Therefore, they are perceived as non-profit organizations. Part of good governance of an energy community is also a long-term motivation for cooperation on the part of the management and, in particular, coordinated care for its members and customers.

1.3 The most suitable organizational structure for the EC in the conditions of Slovakia

A community producing energy from renewable energy sources is a legal entity established for the purpose of producing electricity from renewable energy sources or biomethane. At the same time, an EC can also be established for the supply of electricity or gas, sharing and storing electricity from renewable energy sources or biomethane, aggregation activities, electricity distribution, operation of a charging station or performance of other activities or provision of other services related to ensuring the energy needs of its members with the aim of realizing environmental, economic or social community benefits.
In terms of scope, ECs can be classified as follows:
1) Local – an example is photovoltaics on the roof of an apartment building;
2) Local – the basis is the use of RES within a municipality or self-government;
3) Nationwide – enables sharing of energy from a larger RES source despite the greater distance (they are not the subject of this contribution).

The basic concept of energy communities has been supported by EU legislation, which to this day aims to increase the share of RES and improve energy systems in Member States. One of the main legislative actions supporting the development of electricity sharing is the revision of the Renewable Energy Directive (RED II), which supports the creation of energy communities and energy communities focused on the production, consumption, sharing and storage of energy from renewable sources. In the Slovak Republic, this European legislation was transposed into national law through the amendment of Act No. 251/2012 Coll. on Energy and on Amendments and Supplements to Certain Acts and the adoption of the Regulatory Office for the Network Industries Authority No. 207/203 Coll., which establishes the rules for the functioning of the internal electricity market, the content requirements of the operating rules of the system operator, the organizer of the short-term electricity market and the scope of business conditions that are part of the operating rules of the system operator, through which the legislative framework was supplemented with definitions and rules for energy communities and energy communities.

Energy communities and community energy in Slovakia are regulated by Act No. 251/2012 Coll. on Energy and as amended by later regulations. The usual legal form of functioning of an energy community (EC) in Slovakia is an officially registered legal entity, which in most cases is an interest association of legal entities, but they are not excluded by law and therefore other legal ways of establishing communities are also used, such as the form of establishing cooperatives, which is approximately equally widespread. Energy communities are based on three fundamental principles:
• They are owned and controlled by consumers, local governments or small and medium-sized enterprises
• Communities are open to everyone with voluntary participation, all members can participate in the management and control of their activities
• They focus on delivering environmental and social benefits for their members, rather than generating financial profit.

Legislation, related legal regulations and internal documents for the establishment and operation of an EC are, according to the mapping of the status and possibilities (in the context of the NRGCOM project), dependent both on general regulations on ECs in the European Union and on national regulations, which are regulated in various documents. [1, 4]

Brief description: An association is a legal form of organizing business and related non-business activities in general as a system of functioning based on contractually involved members of the association based on their registration in the association and acceptance of binding documents (statutes, founding documents, etc.) and subsequent registration with the competent state administration body of the Slovak Republic.

The operation of the EC is determined by the documents created during the registration of the association and other internal operating documents, always approved by the highest administrative body of the association. In addition, if the association operates in the field of so-called licensed activities such as energy management, it is necessary to obtain special certificates and certificates (differently marked in the given country of jurisdiction) for the operation of such activities. The authors have already discussed the above in detail in [13]

Administrative and management bodies of the EC: The scheme of the proposed operating model of the energy community interest association type consists of three levels of management: the highest (so-called administrative) level, represented by the founding board of members of the association, the management level (composed of the director, management and operation of the energy production operation and the team for measurement and regulation of systems in the EC. This is followed by the executive level, where internal control and administration, management and operation of the energy distribution operation and a separate team for marketing and sales of EC outputs are located. [5, 8]

When designing such an organizational structure of the EC, the so-called vertical links in the scheme are essential, both in the management and monitoring activities (management and internal control and economic, commercial and personnel administration), but especially in the second branch - the operational activities of the EC, namely the production of energy according to the available domestic energy mix with the contribution of RES, the distribution of energy in a given sphere of influence (local, regional) with the entire technical, technological, personnel and support SW expert background, and the third vertical branch ensuring internal measurement and regulation of the EC systems with impacts on the evaluation of the quality of outputs and the settlement of supplies for customers in cooperation with the EC administration from the first branch of management is also important. At the same time, customer care, mapping of their needs and expectations and resolution of potential crisis situations are ensured within marketing. All these organizational branches and components jointly act on the generally defined main module (Production/Distribution) of the EC's existence and create synergy for its success.

Model Application Potential: According to the results of the research to date within the NRGCOM project in cooperation with foreign partners, it is verified that consumers participate in the self-supply of the EC on the basis of a contract in accordance with the rules of the law of obligations, while it is interesting that they function as members of the EC and at the same time are its customers and consumers in the system of so-called self-supply of electricity.

A sample diagram of the organizational structure is in Figure 1. The presented organizational chart clearly specifies the individual components and links of the functioning of the bodies and organizational units of the energy community as an interest association: [1, 4, 13]

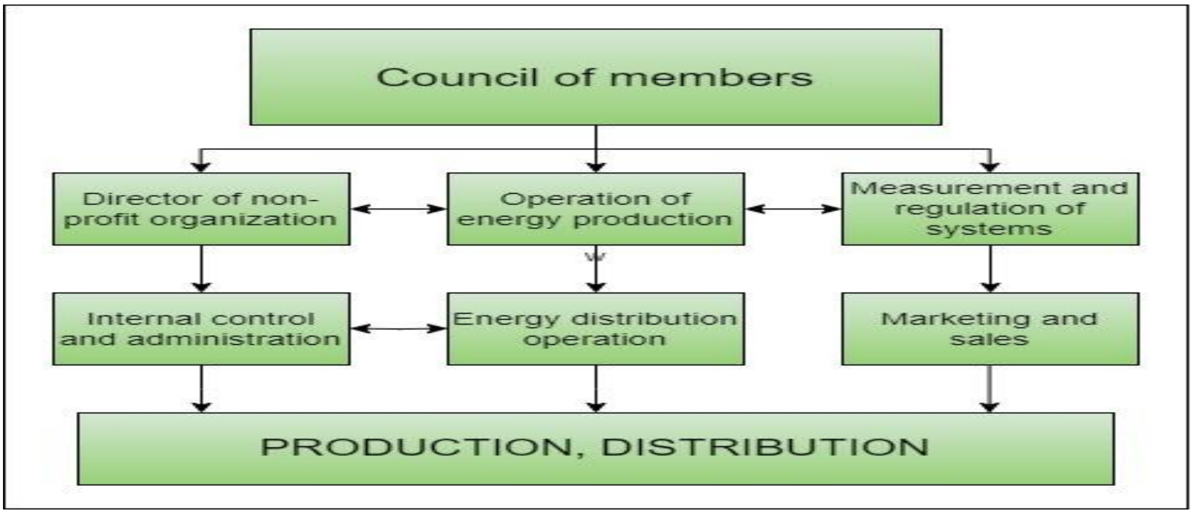

Figure 1 Sample organizational chart with components and links of system components and elements of the EC (created by the team of authors)

The form of the EC based on an interest association is governed by the regulations on the establishment of non-profit organizations or contributory organizations according to the economic laws of the given country and its characteristic feature is that the members of the so-called association participate in its functioning exclusively on the basis of the voting rights of the members, whether dependent or independent/equal in size to the organization of the EC member and accordingly the redistribution of the EC's controlling stake is determined in the founding and administrative documents. According to EU legislation, the association is perceived as a specific form of non-profit organization and does not generate accounting profit, but only the so-called economic growth to support its own development. For any business procedure in the activities of the association beyond its definition of an energy community, in all countries, in addition to registration, it is necessary to establish a separate trade license/permit and to separately report and manage such management. [5, 9, 10]

2 DESIGN, OPERATION AND ENGAGEMENT OF MEMBERS IN THE EC

2.1 Proposal for a model of EC functioning and its operations

The foundation for creating a successful and well-functioning EC or ES is, first and foremost, care for its participants, partners and customers.

A well-functioning EC must always be able to handle issues and issues such as:

- building a community and its structures,
- transfer of experience and education,

- specifying target customer groups and their priorities,
- understanding the needs and expectations of EC partners and customers,
- teamwork,
- communication and business strategy and customer service techniques,
- a plan for resolving and managing conflicts and recognizing risks,
- customer protection rules and the related EC code of ethics,
- transparency and correctness of functioning.

Since the vast majority of ECs are organized and structured as small and medium-sized enterprises, it is important to ensure their functioning and management in the conditions of RES as purposefully set systems with rules and functions, just as is customary in comparable structures of industrial clusters. [12, 13]

The EC in Slovakia is therefore a community of consumers who cooperate on a project aimed at meeting the energy needs of their members. This may involve joint ownership of renewable energy production facilities (e.g. photovoltaic power plants or biomass boilers), its distribution and storage, operation of charging stations, and the like. However, from this perspective, consensus in the EC can be considered impossible. The maximum size of a group of people in which everyone will be heard and everyone will be answered is approximately a group of 15 to 20 people. With a larger number, this is no longer possible. The solution is a hierarchical way of organizing the system in which each element or link, except for the top one, is subordinate to a single superior element or link. The internal organizational structure chosen in this way is a proven way of managing and organizing the everyday life of the energy community.

Figure 2 schematically illustrates a basic operational model foot the implementation and management of RES within a model EC. The EC is presented as an association within SME segment for solving the introduction of specific RES proposals into its energy economy. The diagram conceptualizes the EC as a system (comprising management, personnel and production processes). Into which energy E enters, which is a combination of RES with conventional energy sources (KZE) according to the company's energy mix created in this way. System links in the diagram: 1, 2, 3, 4, show the process of implementing interventions for the introduction of RES and link 5 is the feedback from products and services and their impacts on further information and management of the EC.

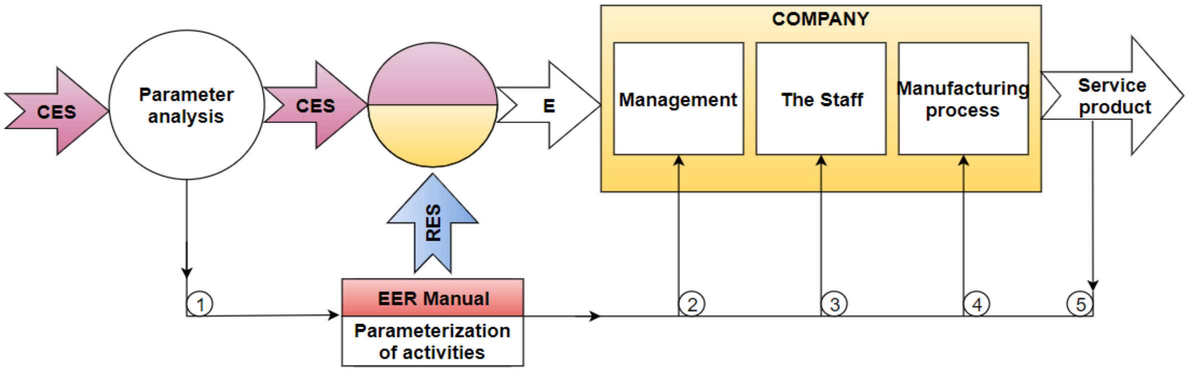

Figure 2 Model of RES implementation in the industrial structure within the EC (created by the team of authors)

2.2 Involvement and Management of Internal EC Members Participation.

The foundational elements of a community are a common territory, direct or indirect social interactions among its residents living in this territory and a sense of togetherness, cohesion, with which people identify with the EC. A number of economic, political, cultural and other activities that are essential for the life of society and its members take place here. A community (except for nationally operating, for example, professional groups) is therefore based on the physical proximity of its members and is also characterized by the institution of neighborhood, which is a certain way in which the inhabitants of the community carry out social interactions, how they organize joint activities in solving problems (in the case of the EC, also self-help activities for achieving energy and environmental goals). It is the neighborhood that creates a community as a subsystem of society from a spatial grouping of people and it is thanks to the neighborhood that people identify with the community, accept social statuses and roles for the community members entrusted with it.

2.3 Decision-Making and Co-responsibility of EC Members

Creating an EC, that operates not merely as community of owners, but a cohesive, functional team of people, is a process that, for example, in the case of implementation in an apartment building or a manufacturing industrial park, will never be completed. This is due to the diversity of things that are being solved, the different impacts of the solved problems on different people, the constantly changing composition of owners and users, and also the different and evolving interests of these people over time. The rule is that an EC is a path and not a destination. [4, 10]

Participation in RES projects should be open to all potential local members on the basis of objective, transparent and non-discriminatory criteria. Part of the measures to compensate for the disadvantages related to the specific characteristics of local ECs producing energy from RES, given their size, ownership structure and number of projects, is to enable them to operate in the energy system and facilitate their integration into the market. Such communities should be able to exchange energy produced by their own facilities with each other.

However, EC members should not be exempt from the relevant costs, fees, levies and taxes that would be borne by end-users who are not members of the communities, producers in a similar situation, or if any public network infrastructure is used for such transfers. Households as consumers and communities participating in the self-consumption of energy from RES should retain their consumer rights, including the right to have a contract with a supplier of their choice and to change suppliers.

The management of EC is characterized by the fact that members primarily communicate well and are personally involved in the implementation of common goals. For the effectiveness of administration, especially in the case of apartment buildings and industrial complexes, it is more than necessary for the management to devote sufficient time and attention to the internal communication of people representing consumers.

2.4 Overcoming Risks, Challenges and Obstacles in EC Governance

The governance of the EC are always elected in the given organizational structures. The decision-making processes are attended by members who have the right to vote, including natural persons, small businesses, municipalities, regions or voluntary associations. The highest body of the EC, usually in the form of an association, is the members' meeting of the association's board of members, where the right to vote is exercised democratically. Each member with the right to vote has an equal participation, while the scope of influence of one member is thus limited.

Specifically, one member cannot exceed 10% of all votes in the community, thus ensuring fair representation and avoiding undue influence. In addition, autonomy is maintained within the EC, as decisions are taken collectively at the members' meeting. The association is responsible for maintaining a list of members with relevant information, thus ensuring transparency and accountability in management. The governing bodies of the EC are therefore elected democratically, which reflects the principles of effective control and autonomy set out in the legislation. How the Energy Community functions in practice depends largely on how the relevant founding document regulates the relations between the members and how the objectives of the community are chosen. In general, each member of the highest EC body has an equal vote, which is usually enshrined in the statutes of the ECs concerned.

First of all, it is necessary to look at the possible outcomes of a conflict between two parties. It is a simple fact that citizens and companies can never win even over a poorly functioning state. The resolution or non-resolution of the conflict itself can end in several situations. In terms of the resulting effect of the conflict, it is mainly important to satisfy the goals, interests and needs of one, the other or both parties. Compromise means finding a possible solution when the parties give up part of their interests in favor of an agreement. The parties can come to such an agreement either through struggle or cooperation, and in this situation there is neither a winner nor a loser. The parties often do not take into account the best possible solution. Compromise at all costs only results in an unrealistic solution that neither party originally wanted. By compromising, the parties only partially satisfy their needs, demands, interests, and goals. Achieving a compromise is much easier in terms of time, but it is true that then the problem will have to be solved repeatedly. [7, 11]

Another way to resolve conflicts offers consensus, which can fully satisfy the most essential needs. The basis of a consensual solution is the significant fulfillment and satisfaction of demands, needs, interests, or goals to the satisfaction of both parties. It logically follows that reaching consensus is definitely not easy. It is especially time-consuming and it is necessary to believe that there are certainly better solutions than those that have already been presented.

3 SPECIFICATION OF THE TARGET GROUP OF PARTNERS AND CUSTOMERS OF THE EC

A typical EC is actually composed of consumers who, as members of this community, cooperate on a project aimed at meeting their energy needs. This may involve joint ownership of equipment for the production of energy from RES (e.g. from a photovoltaic power plant or biomass boilers), as well as its distribution and storage, or the operation of charging stations, etc. However, this group of EC persons provides its services in the field of energy production and distribution for a wide range of local and regional entities - the target group of customers - consumers.

3.1 Scope of Potential Customers of the EC

The target group of the EC are external entities and within the various forms of existence in Slovakia are sometimes only natural persons or small businesses, but they can also be higher territorial units (VÚC), or municipalities in the territorial district of the VÚC in which the relevant community is located. If the electricity produced comes from RES or biomethane, the EC is also a participant in the gas market. It follows from the above that the target group should be ordinary consumers, for which homeowners' associations can also be mentioned as an example.

With the correct setting of the EC, electricity sharing can radically change the way in which electricity is perceived and used. It has potential, especially when using support programs for quick payback and reducing energy consumption costs. Another indisputable advantage is the reduction of the load on the distribution network and a significant reduction in building emissions.

3.2 Management and Communication with the EC Target Group in Practice

One of the most effective changes seems to be the fundamental management of internal management processes in the EC, according to these principles. The transition to new management methods is also enabled by new innovative approaches and new information technologies, which are part of the management information system and the subject of a separate, relatively extensive policy to support the EC's management in the future. This development should be focused on quality and improvement (innovation and new approaches) in EC projects, processes and products. It is necessary to recall here that electricity sharing arose from the need to optimize the use of surplus electricity generated from RES within certain communities or groups of EC consumers. This process allows for a more efficient distribution of the generated electricity between multiple consumption points, thereby contributing to increasing energy efficiency and supporting the use of RES. [8, 12] Electricity sharing itself is a process in which electricity produced from RES or any other conventional source within a certain community or group of customers is shared among multiple points of consumption. The Figure 3 illustrates the coordination of projects and supplies to EC customers within its management process system.

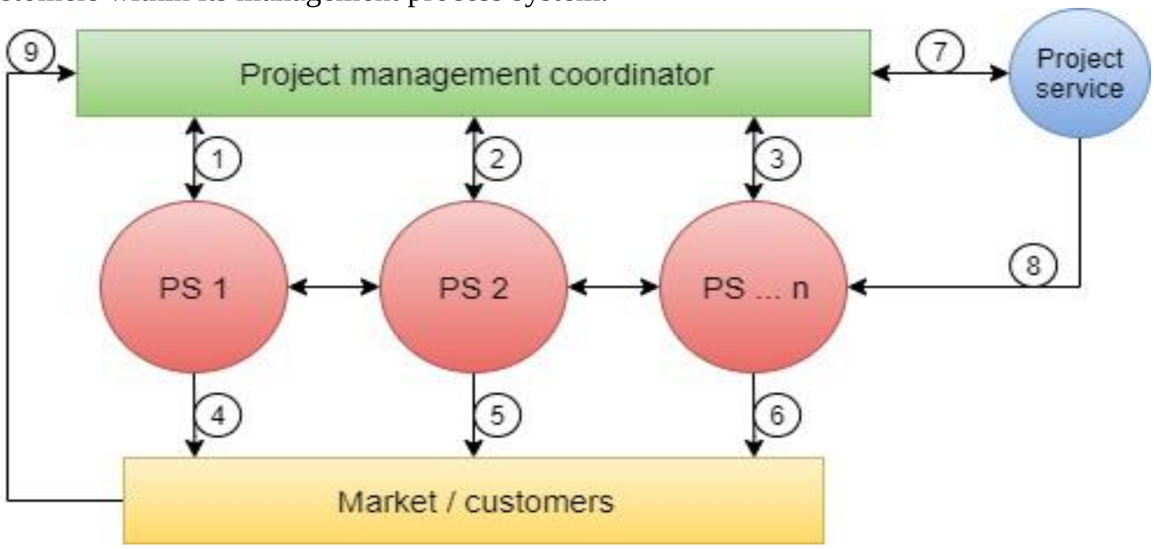

Figure 3 Coordination of projects and deliveries for EC customers/consumers (created by the team of authors)

Electricity sharing in Slovakia is ensured and coordinated through the Energy Data Center (EDC), which ensures data processing, monitoring of electricity consumption and production in all connected points of consumption, as well as settlement of shared electricity between EC members.

As the authors have already stated, the target group is clearly considered to be apartment owners' associations, since they constitute the largest group of consumers in terms of number, which, through the use of the EC system, can have the following two main advantages for their members:

Firstly, apartment owners' associations can use electricity sharing to cover electricity consumption not only in the common areas of the apartment building, but also directly in individual apartments. In this way, apartment owners can gain access to greener and potentially cheaper electricity.

Secondly, it can also increase the value of their properties and improve the overall energy rating of the building. Electricity generation can be achieved, for example, through photovoltaic panels installed on the roof of the apartment building or other suitable location. [2, 6]

However, the above principle generally applies and can also be implemented for the target group of industrial clusters - various purpose- and product-related interconnected clusters in industrial areas with redistribution of energy supplied from the EC.

SUMMARY

Slovakia’s strategic energy objective calls for at least 23% of energy produced by RES by 2030. Despite this, state support for their installation was minimal in 2023 and this situation has not changed even today, even due to the significantly negatively changing European energy market. Currently, photovoltaic panels produce less than 2% of energy, while a capacity of up to approximately 13 gigawatt peaks (GWp) could be installed on the roofs of houses and buildings in Slovakia. Community energy, i.e. the use of energy from shared RES for "self-consumption" in apartment buildings, needs to be enabled and supported legislatively and subsequently with financial incentives. It is thus clear, in comparison with binding European and domestic documents, that this will help Slovakia to come closer to fulfilling its commitment to carbon neutrality by 2050". [2, 9, 10]
The importance of the principle of having an active community of entities behind the EC clearly lies in the existence of a set of measures and tools for managing and servicing services, meeting the needs and expectations not only of the EC members, but especially of their partners and customers. In doing so, it is always paramount to manage the resolution of crisis, risk and problem factors and situations, and especially their prevention and prevention. One of the most attractive aspects of the EC is the fact that the will of the members often carries more weight and they have greater decision-making power than in the traditional relationship between the supplier and the consumer. In the case of disputes, there is often a tendency to resolve them internally, i.e. within the EC. However, disputes can and do arise. The Electricity Directive, for example, requires suppliers to use an alternative dispute resolution system and guarantee consumers the right to access out-of-court dispute resolution mechanisms, such as an energy ombudsman. As consumers in ECs are legally entitled to the same consumer rights as non-members, the same rights to redress and dispute resolution as in traditional supplier-customer relationships should be actively promoted within energy communities. This information must be readily available on the community's website, in the contract and on their energy bills. ECs acting as suppliers should use alternative dispute resolution procedures where necessary.
The authors of this contribution, within the framework of the National Energy Cluster NEK, have long been dealing with the issue of diagnostics, process management and research into methods, tools and management techniques for identifying the innovation potential and vitalization of ECs, industrial cluster organizations and enterprises from the portfolio of SMEs based on RES, including within the framework of the Interreg Danube Region Program grant project DRP0200163 entitled: "Creating suitable operating conditions for renewable energy communities in the Danube Region", with the acronym NRGCOM, funded by the ERDF of the European Union and the Ministry of Investments, Regional Development and Informatization of the Slovak Republic.

Sources

1. Energetické komunity a ich perspektiva na Slovensku. Energy communities and their perspective in Slovakia. Posted on: Energetické komunity a ich perspektíva na Slovensku - Green Deal 4 Buildings
2. Energetické spoločenstvo a komunita vyrábajúca energiu z obnoviteľných zdrojov. Energy Associations and Renewable Energy Community. Posted on: Energeticke-spolocenstvo-a-komunity.pdf (siea.sk)
3. Komunitná energetika. Community energy. Posted on: Komunitná encyklopédia – Wikipédia (wikipedia.org)
4. Energetické spoločenstvá a komunity v slovenskej právnej úprave. Energy communities and associations in Slovak legislation. Posted on: Energetické spoločenstvá a komunity v slovenskej právnej úprave - Poláček & Partners (polacekpartners.sk)

5. Medzinárodný projekt REC4EU zmapoval príležitosti a obmedzenia pre energetické komunity v zahraničí a na Slovensku. The international project REC4EU mapped the opportunities and constraints for energy communities abroad and in Slovakia. Posted on: Medzinárodný projekt REC4EU zmapoval príležitosti a obmedzenia pre energetické komunity v zahraničí a na Slovensku – SIEA
6. NOVOTNÁ, Simona. Model energeticky efektívneho riadenia OZE v priemysle. GRANT journal, Hradec Králové, 2021. ISSN 1805-062X, 1805-0638 (online), ETTN 072-11-00002-09.
7. NOVOTNÁ, Simona a KATI, Róbert. Energic and environmental aspects of RES for industrial businesess in synergy with their innovationpotential. Recenzovaný zborník medzinárodnej konferencie pre doktorandov krajín EU. CER Comparative European Research. Brno, 2021. ISBN 978-1-7399378-0-5
8. NOVOTNÝ, Tomáš a kol.. Koncipovanie inovačných nástrojov energetických a environmentálnych klastrových habitatov. Výskumná úloha č.3.1.1. MH SR+ NEK. Bratislava, 2020. ISBN 978-80-972637-99.
9. NOVOTNÝ, Tomáš a KATI, Róbert a KUBEK, Ivan a MODRÁK, Richard a NOVOTNÁ, Simona a KOPOROVÁ, Katarína: Selected slovak aspects and specifics of building a network of energy communities within the framework of cooperation in the danube region. MMK 2024 International Masaryk conference, volume XV. December 16 - 18, 2024 Hradec Králové, The Czech Republic, Conference Proceedings Published and available at: https://www.vedeckekonference.cz/index.php?option=com_content&view=article&id=92&Itemid=78&lang=en
10. SIEA- Program Slovensko 2021 – 2027 Podpora pre energetické spoločenstvá. SIEA- Programme Slovakia 2021-2027 Support for energy associations. Posted on: Program Slovensko 2021 – 2027 Podpora pre energetické spoločestvá (siea.sk)
11. Slovensko nevyužíva potenciál komunitnej energetiky. Slovakia does not use the potential of community energy. Posted on: Marián Parkányi: Slovensko nevyužíva potenciál komunitnej energetiky | Články | ENERGOKLUB
12. Ako dosiahnuť, aby sa energetické komunity/spoločenstvá stali atraktívnym riešením pre spotrebiteľov? How to make energy communities/communities an attractive solution for consumers? Posted on: Ako dosiahnuť, aby sa energetické komunity/spoločenstvá stali atraktívnym riešením pre spotrebiteľov? - Spoločnosť ochrany spotrebiteľov (sospotrebitelov.sk)
13. SYNOPSIS REPORT-NRGCOM_A.T.1.3 Collection of best internal operational and governance practices of energy communities and available at: https://www.nek.sk/wp-content/uploads/2024/08/NRGCOM_A1.3_Collection of best internal operational and governance practices of energy communities.docx

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